

Review

Intervention Compliance of Diet and Fluids to Interdialytic Weight Gain in Patients with Chronic Kidney Disease Undergoing Hemodialysis: A Systematic Review



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Article Info	Abstract
Article history: Received: 17 December 2022 Accepted: 29 April 2023	<i>Introduction:</i> High fluid accumulation in the body of chronic kidney disease patients with hemodialysis programs is manifested by an increase in the patient's weight. The study aims to determine dietary and fluid adherence interventions for interdialytic weight gain in chronic kidney disease patients undergoing hemodialysis which has been carried out in previous studies.
Keywords: chronic kidney disease, hemodialysis, interdialytic weight gain, dietary compliance	<i>Methods:</i> This study studied the literature using the PRISMA method, search techniques using PICOT from PubMed, Google Scholar, ProQuest, ScienceDirect, and SAGE journals with the keywords chronic kidney disease, hemodialysis, interdialytic weight gain, and diet and fluid adherence. Assessment of articles using JBI Critical Appraisal for Quasi-experiments. <i>Results:</i> The 12 articles reviewed showed that dietary and fluid adherence interventions affected increased interdialytic weight gain in chronic kidney disease patients undergoing hemodialysis. The form of intervention is fluid management calendar, an interdialytic weight gain (IDWG) calculator, health education, nutrition guidelines, and mobile phone-based reminders. <i>Conclusion:</i> The value of interdialytic weight gain is influenced by dietary and fluid adherence in patients with chronic kidney disease. Health education plays a major role in increasing knowledge and adherence to diet and fluids so that complications of fluid accumulation can be minimized.

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INTRODUCTION

Chronic kidney disease is a disease with a relatively high prevalence in the world. There are ten people in the global population and one person who has chronic kidney disease at some stage. The results of WHO global prevalence data are 13.4% and are the 12th cause of death in the world. According to sources from the World Health Organization (WHO), Chronic Kidney Disease (CKD) is a problem with an increasing incidence every year. The incidence of chronic kidney disease in Indonesia currently amounts to 713,783 sufferers [1]. The morbidity and mortality rate of patients with end-stage renal disease is approximately 22% [1]. Management of chronic kidney disease includes hemodialysis by 78%, Continuous Ambulatory Peritoneal Dialysis (CAPD) by 3%, and kidney transplantation by 16%. Chronic kidney disease patients undergoing hemodialysis increased from 77,892 [2]. The Central Java region reported 7,906 new patients [2]. Chronic kidney disease is a progressive and irreversible kidney disorder in which the body is unable to maintain metabolism, is unable to maintain fluid and electrolyte balance and increases urea [3].

Fluid restriction is a major problem in patients undergoing hemodialysis. This condition is caused by poor adherence to dietary and fluid restrictions. Poor adherence to diet and fluid can lead to complications including cardiovascular disease, pulmonary edema, fluid accumulation, morbidity and mortality. This weight gain is described as weight gain between dialysis times or what is called interdialytic weight gain. One of the

things that supports the improvement of good nutritional management is patient adherence. Patient compliance is defined as patient behavior in accordance with the provisions given by health workers [4]. Factors that affect adherence to hemodialysis patients, namely education, involvement of health workers, family support, patient self-concept, patient knowledge, gender, self-management, and duration of hemodialysis [5]. Excessive fluid intake in people with chronic kidney disease can be seen through increased body weight or interdialytic weight gain status, namely weight gain between two hemodialysis sessions. The value of interdialytic weight gain in hemodialysis patients is recommended not to be more than 3.5% [6]. Poor adherence to fluid intake management is detrimental to long-term survival in patients undergoing hemodialysis. Hemodialysis patients are often advised to reduce water intake, but this suggestion is not always followed during the process of undergoing a hemodialysis program [7].

Patients with chronic kidney disease undergoing hemodialysis programs must make dietary adjustments, routine care, and limit fluids [6]. Sodium build-up results in a decrease in kidney function that is not optimal to maintain homeostasis and ultimately causes an increase in extracellular fluid volume during the interval between hemodialysis [8]. In addition, renal failure patients undergoing hemodialysis therapy often experience maladaptive coping, and non-compliance with fluid restriction, and these are all causes of increased interdialytic weight gain.

Intervention and evaluation of health technology in the management of patients undergoing hemodialysis is getting results that health interventions have good outcomes in the management of chronic dialysis patients, and also report no significant improvement of dialysis specific measures and some components of overall quality of life assessment [9]. Results from other studies indicate that it is uncertain whether using mHealth as an intervention is able to improve clinical outcomes in patients compared with usual treatment for people with chronic kidney disease although analysis shows that patients using electronic self-monitoring devices can reduce the average interdialytic weight gain by 0.13 kilograms [10]. Patients need media that can help control their daily interdialytic weight gain values. This is consistent with research on the effectiveness of the interdialytic weight gain (IDWG) calculator on the stability of interdialytic weight gain in chronic kidney disease patients. The IDWG calculator is proven to affect the stability of interdialytic weight gain values because patients can see interdialytic weight gain values at any time at home and will be able to limit diet and fluids independently if the interdialytic weight gain values increase [9].

Many studies have been conducted regarding interdialytic weight gain and adherence to diet and fluids, so it is necessary to conduct a literature review or summary of the literature on interdialytic weight gain and adherence to diet and fluids. This systematic review aims to determine the effect of dietary and fluid adherence on Interdialytic Weight

Gain values in chronic kidney disease patients undergoing hemodialysis programs.

METHODS

Literature Search Strategy

The design of this research article is a literature review from the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA). The PICOT method was used as a guide for the clinical search of articles. Search sources for research articles using electronic databases such as Google Scholar, Science Direct, PubMed, ProQuest, and SAGE Journals. Searching for research articles according to the inclusion and exclusion criteria that have been determined with the framework and keywords used so that they can get research articles that match the research title or are almost the same. The keywords in the search for evidence-based research in this systematic review were interdialytic weight gain AND diet adherence AND chronic kidney disease OR hemodialysis. The data synthesized is an intervention in the assessment of interdialytic and weight gain obedient diet for patients with chronic kidney disease who underwent hemodialysis program in a quasi-experimental form. This search was limited to 2017 and 2022 articles because it was based on recent articles on emerging issues related to IDWG interventions and dietary adherence to chronic kidney disease undergoing hemodialysis.

Framework Used (PICOT)

The process begins with formulating a PICOT which is used to direct authors in a clinical

search for articles. PICOT stands for 5 components, namely: P (patients, population, problems) patients with chronic kidney disease undergoing hemodialysis program, I (intervention, prognostic factors, exposure) assessment of interdialytic weight gain (IDWG) and dietary compliance, C (comparison, control), diet adherence and O (outcome) increased dietary adherence in patients with chronic kidney disease undergoing hemodialysis programs, and T (Time), namely 2017 to 2022.

Keywords Used

Keywords are used for searching articles in writing this systematic review to make it easier to know the essence of this article. Keywords are short words that can describe the theme of the article or document. The keywords in this evidence-based research searched in this systematic review are interdialytic weight gain AND diet adherence AND chronic kidney disease OR hemodialysis

Databases or Search Engines

The primary research article search uses electronic databases to find relevant research articles. The databases used include: Google Scholar journals, Science Direct, ProQuest, PubMed, and SAGE journals. The process of selecting articles was carried out with inclusion and exclusion criteria.

Inclusion criteria

The author determines the criteria for research articles to be reviewed in this systematic review, namely (1) adult chronic

kidney disease patient population receiving hemodialysis therapy, (2) research articles with intervention or experimental quantitative study design using quasi-experimental research methodology, (3) research articles with measurement tools and outcomes in the form of interdialytic weight gain and dietary compliance in chronic kidney disease patients with hemodialysis programs, (4) research articles that have published in the last 6 years, (5) publication of research articles in Indonesian and English and has been published.

Exclusion Criteria

The exclusion criteria were (1) the population of pediatric patients and CKD patients who were not on hemodialysis therapy (2) non-English publication articles (3) non-quantitative research articles with intervention or non-experimental designs.

Selection of Article Quality Studies and Assessments

Article Results

The search for research articles is carried out relevantly according to what has been formulated in the PICOT framework. Searches use electronic databases such as Google Scholar, Science Direct, PubMed, SAGE journals, and ProQuest, which are then adjusted according to the keywords and inclusion and exclusion criteria that have been prepared. Featured articles are research articles that can be downloaded or accessed by authors. The research articles studied were restricted within the last 6 years, or articles

from January 1, 2017 to December 31, 2022, to discuss the most recent research articles, so research articles prior to 2017 were not reviewed in this systematic review according to the inclusion and exclusion criteria.

The search flow for research articles uses the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) method which begins with collecting articles according to keywords from various databases used. Articles obtained from electronic searches through the database amounted to 996 articles. Namely with the following details: Google Scholar 780 articles, PubMed 50 articles, ProQuest 101 articles, ScienceDirect 53 articles, and SAGE journals 12 articles.

After that, a check is performed for duplicate titles, and the same title is removed from the article search process. The search is continued by deleting articles that have titles that are irrelevant to the topic to be reviewed. Selection is then followed by filtering abstracts according to predetermined inclusion criteria and articles that do not comply will be removed from the search process. Furthermore, research articles that have been screened up to this stage will be re-screened through full-text screening where articles that meet the inclusion criteria and have no problems from the point of view of research methodology will be involved in the review process for further article evaluation. The detailed research article search flow based on the PRISMA method can be seen in Figure 1.

Article Quality Assessment

For selected research articles with a Quasi-experimental design, their quality was assessed using the JBI Critical Appraisal Checklist for Quasi-Experimental Studies. This critical assessment JBI instrument contains 9 questions related to quasi-experimental design studies. The purpose of this assessment is to assess the methodological quality of a study and to determine the extent to which a study addresses possible bias in design. This assessment can be used to inform the synthesis and interpretation of research results. (Joanna Briggs Institute, 2017). The risk of bias in this systematic review is carried out by determining data extraction including the similarity of the articles both in terms of study design, research objectives, and outcomes resulting from the included research articles and assessing the quality of the research articles reviewed. The Joanna Briggs Institute (JBI) Critical Appraisal was used to assess and analyze the methodological quality of the articles that had been obtained (n = 12). As agreed by the researchers themselves if the final score of the methodological quality assessment if it reaches at least 50% and meets the critical appraisal criteria, the article will be selected for data synthesis. All articles (n = 12) in the last screening achieved a score between 77% and 88%, which means that the score reached > 50% higher so that data synthesis could be carried out. Articles will be selected for data synthesis.

Data Extraction

For this research article, data extraction was designed to guide information from notes to fit the research objectives. The data extracted in each research article includes the author, year, population and setting, study design, research objectives, methods and interventions, instruments used, as well as follow-up time and results produced from each research article. Then the data to be extracted in the results section are the author, year, method of intervention analysis, results, and conclusions.

Result Synthesis

Data synthesis was carried out qualitatively by the authors and then the selected articles were analyzed. All interventions aimed at improving dietary adherence and management of interdialytic weight gain values in CKD patients on hemodialysis are reported in this systematic review.

Search Result

Figure 1 presents a systematic search flowchart. Of the 996 research article titles identified, 138 full-text articles were then assessed for the quality of the research articles and finally, 12 research articles were systematically reviewed.

Characteristics of Synthesized Research Articles

An overview of the 12 reviewed articles is summarized in characteristics associated with interventions in hemodialysis patients

with the goals of dietary adherence and fluid restriction and interdialytic weight gain values. Regarding the instructions given, the instruments, follow-up, and results are presented in Table 1. This systematic review consists of 11 research articles with a Quasi-experimental design, namely: (Nursalam et al., 2020, Kusumawardani, 2019, Tata Mahyuvu and Siti Nur Hasna, 2021, Meylani et al., 2019, Vendi Riswanda, 2019, Ni Luh Widiani, 2018, Ria Desnita, 2019, Nadri, 2020, Baser M, 2019, Tarek Mahmoud, 2017 and Ok Lee Park, 2019) and 1 pre-experimental article (Setiowati, 2022).

RESULTS

Interdialytic weight gain (IDWG) was used as a parameter for food and fluid intake between hemodialysis sessions. IDWG was measured as the weight before the hemodialysis session, minus the post-dialysis weight of the previous session. IDWG can affect the blood pressure and survival of hemodialysis patients. A higher IDWG is associated with the amount of fluid intake or food consumed and dry weight. IDWG in patients undergoing hemodialysis programs is often uncontrolled due to low patient adherence to fluid intake and dietary restrictions. The patient's inability to control fluid intake is due to thirst and the sensation of dry mouth or xerostomia caused by increased levels of angiotensin II and blood urea and a significant reduction in salivary flow in hemodialysis patients [11]. Dietary non-compliance includes factors from patients and families as well as several psychosocial factors as well as demographic factors (age, gender, and level of education),

fluid intake, thirst, social support, self-efficacy, and stress. However, if it is accompanied by disease, the patient may not be able to adapt to these changes [12].

There is an effect of dietary compliance on the IDWG value which is manifested by dry weight gain. In this study, 49% of respondents were in the non-adherence category and experienced an increase in interdialytic weight gain which was included in the moderate addition category and 4% were included in the high category due to non-compliance with dietary and fluid restrictions [13]. The IDWG value is based on the percentage of the patient's weight gain, where the IDWG value is said to be mild if the weight gain is not more than or equal to 3% of body weight during 2 hemodialysis sessions, during the first post-hemodialysis and the second pre-hemodialysis, moderate category if it is severe body weight increased by 4% - 6%. If the weight gain is more than 6% then it is categorized as heavy [11]. IDWG can be avoided by controlling fluid intake, managing thirst, and increasing patient self-efficacy. Dietary compliance is important in controlling the stability of interdialytic weight gain values [14]. In this systematic review, it is expected to be able to answer questions about the effectiveness of diet and fluid adherence to interdialytic weight gain in chronic kidney disease patients undergoing hemodialysis programs.

The 12 research articles can be divided into 2 groups, namely research articles related to IDWG and groups related to dietary and fluid adherence in chronic kidney disease patients undergoing hemodialysis programs. The results to be achieved are combining the

factors associated with an increase in IDWG and factors that affect dietary adherence and fluid restriction in patients with chronic kidney disease undergoing hemodialysis programs.

The IDWG calculator will help control the stability of interdialytic weight gain values in chronic kidney disease patients with hemodialysis programs and is proven to be effective [14]. Respondents who use the IDWG calculator can find out their IDWG status and provide advice and tips on managing fluid intake according to their needs. In this study, the IDWG calculator can influence CKD patients with hemodialysis programs to limit fluids and diet so that the stability of IDWG values can be guaranteed. IDWG control is needed to be able to control the daily diet of CKD patients and avoid complications from fluid accumulation in the body. Likewise, Vendi Riswanda's research (2021), entitled "The Effectiveness of Using Fluid Management Calendar and Mobile Phone on Interdialytic Weight Gain in Chronic Kidney Failure Patients in the Hemodialysis Room", also discusses IDWG. This research is about fluid management calendars and cellular phones as tools used to send short messages. This study aims to determine the effectiveness of using a fluid management calendar and reminders using a mobile phone in the form of short messages sent to IDWG in CKD patients. The data was obtained by weighing the body weight between the 2 dialyses before and after the intervention. The sample was divided into two groups: the intervention group and the control group. The intervention group was given fluid management treatment using a mobile phone

and the other group was given a fluid management calendar. Respondents' weight data after hemodialysis session 1 and before session 2 in 1 week was collected. The difference between the two weights is the initial data from the IDWG or patient pre-test. In the second session of hemodialysis, patients were given interventions according to their respective groups and an explanation of the procedure for using the fluid management calendar, and the other group was explained by sending SMS to control daily fluid intake. In the second week, the respondents returned to measure their weight. The difference in the weight of the second post-hemodialysis and the third pre-hemodialysis was used as post-test data. The results showed that most of the respondents (90%) had a moderate weight gain classification and 10% were included in the weight classification on the pre-test. Whereas in the post-test, respondents who had a mild weight gain classification of 45%. The results of the Wilcoxon signed-rank test showed a value of $p = 0.006$, which means that there was an effect of using the fluid management calendar on the increase in IDWG. Respondents in the intervention group with mobile phones (SMS) found data on an increase in the number of respondents who experienced an increase in the IDWG mild classification. From the Wilcoxon test, the signed-rank test showed a p -value $= 0.006$ which means that there is an effect of using a mobile phone on increasing IDWG. The conclusion with the Mann-Whitney test is obtained $\alpha = 0.05$, the result of p -value $= 0.328$. This means that there is an effect of cell phone use on the increase in IDWG among

respondents. In this study, respondents received short messages in the form of instructions to limit fluid intake, then they practiced the theory and followed these instructions. Respondents also received support and motivation as well as reminders regarding their willingness to recover and adherence to control fluid intake when given the cell phone intervention. It supports the reduction of interdialytic weight gain. [15]. This means that there is no difference in effectiveness between the use of fluid management calendars and cell phones against IDWG values. Both of these interventions are considered to affect values in CKD patients with hemodialysis programs.

Ria Desnita's research (2019), entitled "The Effect of peer education methods on Interdialytic Weight Gain (IDWG) in hemodialysis patients", aims to determine the effect of peer education methods on IDWG in hemodialysis patients. The first step is to provide health education in 3 meetings with peers regarding hemodialysis therapy and fluid restriction. After that, peer education was given to hemodialysis patients for 2 weeks. The results of this study differed on average before peer education was given 5.35 and after the peer education intervention was 2.87. The IDWG score decreased by 2.46 after intervention in the form of peer education methods. The statistical test showed $p = 0.000$ ($p < 0, 05$) which means there is an effect of IDWG before and after peer education is given to IDWG hemodialysis patients. Peer education is a structured approach to providing health education that aims to change knowledge, attitudes, and behavior by providing health education. The decrease in

the IDWG value was influenced by the provision of health education to hemodialysis patients. The conclusion is that peer education can improve dietary adherence in fluid restriction and affects the value of interdialytic weight gain in CKD patients.

From the three studies above, it can be concluded that the IDWG calculator, fluid management both by calendar and by cell phone (SMS), and peer education can affect the stability of the IDWG. Although IDWG stability is also related to fluid intake management and diet management.

Nursalam's research, (2020) entitled "Automatic reminder for fluids management on confidence and compliance with fluid restrictions in hemodialysis patients", this study consisted of 2 stages, namely developing an application prototype and evaluating patient problems using questionnaires and interviews. The research design is quasi-experimental. The development of this application prototype involves the collection of fluid intake and output, fluid control log, education, and automatic fluid reminders. This health education is given while the patient is in the hospital and preparing to leave. This is a reminder. Patient discharge planning must be well prepared, providing education regarding diet and limiting fluid intake. Effective media for providing health education still do not exist and are incomplete so there are still patients who lack of knowledge, have low confidence, and low self-efficacy and most patients show a low level of adherence to fluid restrictions. With this automatic fluid reminder application, it is hoped that it can help CKD patients manage their diet and fluid

restrictions. This application is called ALISA (Automatic Fluid Control Hemodialysis). The results of this study are that there is a significant influence on the development of discharge planning interventions with automatic reminders of fluid management in the components of confidence and adherence regarding IDWG in hemodialysis patients. Automatic fluid planning application or android system-based reminder for fluid management in CKD patients is considered feasible with $p\text{-value} = 0.001$ after intervention using discharge planning with automatic reminders which means that discharge planning and this application increase patient compliance in fluid restriction. Considering that this application is quite complete, consisting of health education, fluid monitoring, fluid status charts, hemodialysis control, and automatic fluid management reminders.

Tata Mahyuvi's research, (2021) entitled "Improving the Compliance of Fluid Diet of Patients with Chronic Kidney Failure with Family Support-Based Health Education", in this study analyzed health education based on family support for dietary compliance and fluid intake in CKD patients. These respondents were given health education based on family support to increase health knowledge in improving the health status of CKD patients. The results of this study were that before being given health education based on family support of CKD patients who adhered to a diet as much as 50% and after being given health education based on family support, 70.8% of respondents adhered to dietary restrictions, and excess fluids.

Ni Luh Widiani's research (2018), entitled "Analysis of the Influence of Health Education on Fluid Diet Compliance and Interdialytic Weight Gain (IDWG) in Hemodialysis Patients", aims to analyze the effect of health education on IDWG and fluid diet adherence in CRF patients with hemodialysis. This research method uses intervention in the form of health education using audiovisuals in the form of power points and leaflets. Data collection tools were questionnaires and observation sheets as well as measurements of body weight before and after counseling 1 month after the intervention. The results of this study used a univariate test, the majority of respondents used a liquid diet pre-intervention 71.6% and post-intervention 93.8%. For IDWG results before intervention with an increase in IDWG > 3-4 kg of 27, 2%, and after the intervention there was an increase in IDWG > 2-3 kg of 28.4%. By Wilcoxon analysis, significant differences were found in adherence to a liquid diet ($p = 0.000$) and IDWG ($p = 0.005$) before and after health education. While the results of the ordinal logistic test was carried out simultaneously the level of education and intervention in the form of health education on adherence to a liquid diet was 41.2%, which means that the level of education and health education affected patient compliance. The distribution of fluid diet adherence of CRF patients before the non-adherent intervention was 28.4% and after the intervention in the form of non-adherent health education, there was a decrease to 6.2%. In IDWG after the intervention, 7 respondents experienced a decrease in IDWG of 0-1 kg. In the multivariate analysis with

ordinal logistic regression test on the fit model feasibility test that the effectiveness of health education on adherence to a liquid diet with a decrease of -2 log-likelihood of 13.43 with a p -value = 0.002 (<0.05) means that the independent variable model provides accuracy which is good for predicting fluid diet adherence in hemodialysis patients. Health education is provided through electronic media in the form of visuals and LCDs with pictures, sharing funds by distributing leaflets after counseling, or health education is given to hemodialysis patients. In this study, the researchers gave health education in 1 meeting and at the end of the meeting, the researchers gave a leaflet as a guide for hemodialysis patients. It means that the independent variable model provides good accuracy for predicting fluid diet adherence in hemodialysis patients.

Meylani, (2019) titled "Data analysis used the Chi-Square and Wilcoxon tests to assess the distribution and degree of difference, while the Mann-Whitney test was used to assess differences in the intervention group and the control group. Multivariate used ordinal logistic and binary logistic regression tests to assess the effects of psychoeducational interventions on the adherence of respondents to diet or fluids. As a result, the intervention group increased by 47.6% to 84.4% and the non-compliant group decreased from 52.4% to 14.6% which showed a significant increase of $p = 0.000$ ($p < 0.05$). After the intervention, the distribution of dietary compliance was 44.6%, and non-compliance with dietary and fluid restrictions was 55.4%. In the control group adherence in the pre-test session was 36.7%,

non-compliance was 63.8%, and increased in the post-test by 80% adherence to and 20% non-adherence to the recommended diet. From these results, there was a significant increase in the level of compliance with a value of $p = 0.000$ ($p < 0.05$). In the intervention group, 85.4% of the results were obtained according to the diet program, and in the control group, 80% adhered, so this study concluded that psychoeducation can assist adherence to a liquid diet in CKD patients with hemodialysis program therapy.

Satiti Kusumawardani, (2019) entitled "Comparison of the effectiveness of audiovisual media and leaflets on dietary compliance and fluid restriction in chronic kidney failure patients", used a quasi-experimental design with 2 groups, namely the control group with education using leaflets and the intervention group with education through audiovisual or videos. This study uses paired t-test with the condition that if the normality test is fulfilled and uses the Wilcoxon signed-rank test if the normality test is not fulfilled with a p-value $< \alpha$ (0.05) then H_0 is rejected and H_1 is accepted. The results showed an increase in the frequency of adherence to fluid restrictions in patients with CKD in the control group from 33.3% to 95.2% with education using leaflets. From the Mann-Whitney test, there was a difference in scores between the control group and the intervention group after education with a p-value = 0.48 $< \alpha$ (0.05) while the scores in the intervention group increased by an average of 4.28 ± 1.36 , in the control group control (using leaflets) of 3.19 ± 1.36 . There is an educational effect of using audiovisual media and leaflets on adherence to a liquid diet. Based on the

compliance score after education, the educational results obtained were that education using audiovisual media was higher than using leaflet media.

Research by Nadri et al., 2020 entitled "The Effect of Education on Fluid Control and Diet". This study aims to determine the effect of a training program on adherence to diet and fluid restriction. Respondents in this study were divided into 2 groups with a total number of respondents were 50 patients with hemodialysis. 25 respondents with the intervention were given an educational program. The other 25 patients were not given the educational program intervention as the control group. At the end of this educational program was given a fluid control in hemodialysis patients scale (FCHPS) questionnaire, and dialysis diet and fluid non-adherence questionnaire (DDFQ). Measurements are made at the end of the program.

Baser M's research, 2019 entitled "The effect of the hemodialysis patient education program on fluid control and dietary compliance", aims to determine the effect of nutritional education booklets on hemodialysis patients. The number of respondents was 78 and divided into 2 groups, 38 respondents as the intervention group who were trained in 4 months and the measurement tools were also given, and 40 respondents as the control group. The control group was interviewed twice at the start of the study and once in 2 months later. Measurement of data using a sociodemographic characteristics questionnaire, dialysis diet and fluid non-adherence questionnaire DDFQ and fluid

control in hemodialysis patients scale FCHPS questionnaire.

Tarek Mahmood et al.'s research, (2017) entitled "The Effect of Nutrition Guidelines Developed on Interdialytic Weight Gain among Hemodialysis Patients", aims to determine the effect of nutritional guidelines on the value of interdialytic weight gain in hemodialysis patients.

Ok Lee Park's research, Sung Reul Kim, (2019) entitled "Effects of Integrated Self-Management Programs on Hemodialysis Patients", aims to determine the effects of integrated self-management programs on hemodialysis patients. In this study, 84

patients were involved with 42 patients as the intervention group who were given an integrated management program for 8 weeks and 42 patients who were included in the control group were left without an integrated management program. In the intervention group and the control group, their weight was measured before being given the intervention and re-weighed after being given the intervention for 8 weeks. After weighing all respondents, it was found that a decrease in the value of the ratio of interdialytic weight gain to dry body weight was found to occur significantly in the intervention group.

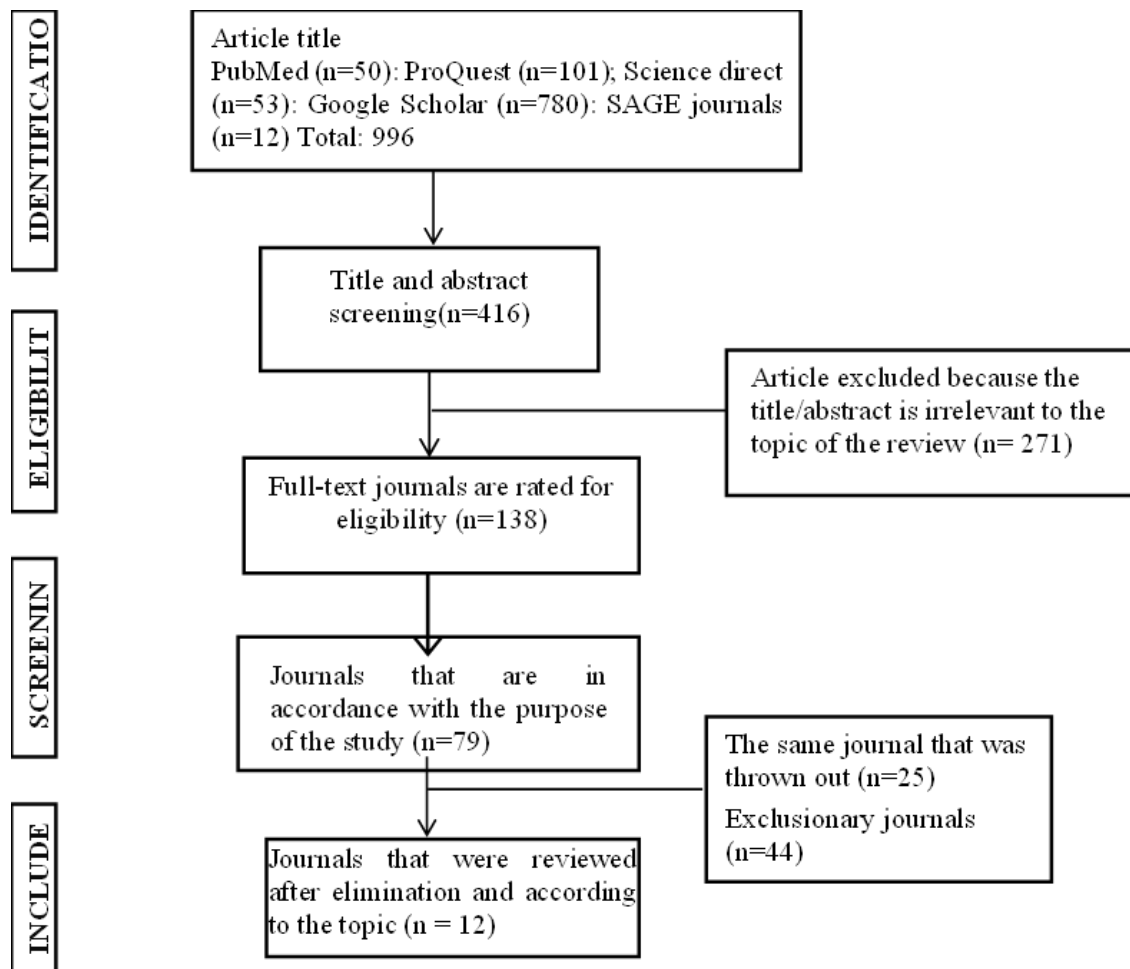


Figure 1. PRISMA Selection Process

Table 1

List of Featured Articles for Analysis

No	Author	Year	Title	Methods (Design, Sample, variables, Instruments, Analysis)	Research Results
1	Nursalam et al.	2020	Automatic reminder for fluids management on confidence and compliance with fluid restrictions in hemodialysis patients	D: Research and development and quasi-experiments S: simple random sampling V: Application of discharge planning with an automatic reminder of fluid management and compliance with liquid restrictions. I: Questionnaires, observations, and interviews A: MANOVA-test	The results of interviews with target users show that the application is worth using. Effect of intervention on (threat perception, benefit perception, barrier perception, and self-efficacy) with $p = 0.001$, fluid restriction compliance, and IDWG $p = 0.001$ after intervention using discharge planning development with automatic reminder application. The development of discharge planning with an automatic reminder of fluid management consists of several menus and the main feature is an automatic fluid monitoring reminder. The app can increase confidence in fluid restriction and adherence in patients undergoing hemodialysis.
2	Satiti Kusumawardani	2019	Comparison of the effectiveness of audiovisual media and leaflets on dietary adherence and fluid restriction in patients with chronic renal failure	D: Quasi-experiments S: Purposive sampling V: audiovisual media and leaflets, dietary adherence, and fluid restriction in chronic kidney disease patients. I: Questionnaires and observation sheets A: Quasi-experiment, pre-test post-test with the control group	In the control group, fluid adherence scores in CRF patients differed significantly ($p=0.000$). In the treatment group, fluid adherence scores in CKD patients differed significantly ($p=0.000$). There was a difference in post-education compliance scores between the control and experimental groups ($p=0.040$). Education using audio-visual is very effective to increase one's knowledge, so it is recommended for subsequent researchers to conduct health research using audio-visual methods in more than one meeting.
3	Setiowati, Tutut	2022	Effectiveness of the IDWG calculator on IDWG stability in patients with Chronic Kidney Disease undergoing hemodialysis at dr. Harjono Ponorogo Hospital	D: Pre-experimental pre-post-test group S: Purposive Sampling V: IDWG stability and dietary adherence of chronic kidney disease patients with hemodialysis. I: IDWG calculator application and IDWG diary A: Wilcoxon signed rank with a significance level of < 0.05	The results showed that before using the IDWG Calculator, 4 respondents (26.7%) had a stable IDWG, but after using the IDWG calculator, 11 respondents (73.3%) had a stable IDWG. The results also showed a value = 0.020 which means that the IDWG Calculator is effective against IDWG stability in chronic kidney disease patients undergoing hemodialysis at Dr. hospital. Harjono Ponorogo. Respondents who undergo hemodialysis and use the IDWG calculator can find out the idea status today and do tips on managing fluid intake as needed.
4	Tata Mahyuvi, Siti Nur Hasina	2021	Improving the Compliance of Fluid Diet of Patients with Chronic Kidney Failure with Family Support-Based Health Education	D: Quasi-experimental with pre and post-design approaches S: Total Sampling, simple random sampling V: Family-based Health Education and fluid dietary adherence of chronic kidney disease patients. I: Health education based on family support A: Wilcoxon Signed Ranks	The results of this study show $p = 0.000$ which means that health education based on family support has a significant effect on dietary fluid compliance before and after health education based on family support. Conclusion: health education-based family support is effective in improving the fluid dietary compliance of patients with chronic renal failure and is highly recommended for patients undergoing hemodialysis therapy
5	Meylani Dewi Wowor, Ni Luh Widani, Emiliana Tjitra, 2019	2019	Effective Psychoeducation to Reduce Anxiety and Increase Compliance of Liquid Diets in Chronic Kidney Disease Patients During Hemodialysis	D: Quasi-experimental pre-post with the control group. S: Purpose sampling V: Psychoeducation, adherence to a fluid diet in chronic kidney disease patients with a hemodialysis program. I: Compliance Questionnaire with the End Stage Renal Disease-Adherence Questionnaire (ESRD-AQ) and dietary adherence questionnaires. A: Wilcoxon signed the rank test and Mann-Whitney test	<i>Wilcoxon test</i> results showed significant differences in anxiety levels ($p<0.005$) and fluid dietary adherence ($p<0.005$) before intervention. The results of the Mann-Whitney test showed no significant difference in decreased anxiety levels ($p=0.456$) and increased levels of fluid diet adherence ($p=0.495$) between the intervention and control groups. The results of the ordinal, psychoeducational logistic regression test lowered anxiety levels with an OR value of 6.5 times compared to the control group. The results of the binary, psychoeducational logistic regression test improved the level of fluid dietary adherence with an OR value of 2.4 times compared to the control group. Conclusion: Psychoeducation can help reduce anxiety levels and adherence to the fluid diet of CKD sufferers with hemodialysis.
6	Vendi Riswanda	2021	The Effectiveness of Using Fluid Management Calendar and Mobile Phone on Interdialytic	D: Quasy-experiment with pre-test-post-test design without control. S: Purposive Sampling V: Fluid management calendar, mobile phone, and interdialytic weight gain in chronic kidney disease patients.	The results of the Mann-Whitney U Test showed no difference in the effectiveness of the use of fluid and mobile phone management calendars against interdialytic weight gain in chronic renal failure patients (p -value = 0.328 or $p>0.05$). The use of fluid management calendars and mobile phones is equally effective for reducing interdialytic weight gain in

No	Author	Year	Title	Methods (Design, Sample, variables, Instruments, Analysis)	Research Results
			Weight Gain in Chronic Kidney Failure Patients in the Hemodialysis Room	A: Wilcoxon Signed Rank Test and the Man-Whitney Test.	chronic kidney disease patients. The results of the Mann-Whitney U Test showed no difference in the effectiveness of using fluid management calendars and mobile phones against interdialytic weight gain in Chronic Kidney Disease patients (P value= 0.328 or P>0.05). The use of fluid management calendars and mobile phones is equally effective for interdialytic weight gain loss in chronic kidney disease patients
7	Ni Luh Widiani	2018	Analysis of the effect of Health Education on Fluid Diet And Interdialytic Weight Gain (IDWG) in patients with Hemodialysis.	D; Quasi-Experiment pre-test – post-test within the control group. S: Purposive sampling V: Health Education, Fluid Diet Adherence, and Interdialytic Weight Gain (IDWG) I: Questionnaire, observation, and weight loss before and after the intervention A: Wilcoxon signed rank test, ordinal logistic regression.	The univariate results of the majority of respondents adhered to pre-intervention fluid diets (71.6%) and post-intervention (93.8%). The majority of IDWG pre-intervention > 3-4 kg (27.2%) and post-intervention > 2-3 kg (28.4%). Wilcoxon test results showed significant differences in fluid diet adherence rates (p=0.000) and IDWG (p=0.005) before health education. The results of the ordinal logistic test simultaneously contributed dependent variables and interventions to fluid diet adherence by 41.2%. In conclusion, the level of education and health education interventions affects patient adherence to fluid diets and IDWG values.
8	Ria Desnita	2019	Effect of peer education method on Interdialytic Weight Gain (IDWG) in hemodialysis patients	D: Quasi experiment S: Non-Probability sampling with consecutive sampling V: Educational peer education method and interdialytic weight gain values I: Peer education A: Paired T-test	The results of this study differed on average before peer education was given 5.35 and after peer education interventions was 2.87. The decrease in IDWG value was 2.46 after an intervention in the form of peer education methods. Statistical tests show p = 0.000 (p<0.05) which means there is an influence of IDWG before and after peer education is given to IDWG of hemodialysis patients. The decrease in IDWG value is influenced by the provision of health education to hemodialysis patients. The conclusion that peer education may improve dietary adherence in fluid restriction affected CKD patients' interdialytic weight gain value.
9.	Nadri A et al	2020	Effects of Education on fluid and diet control	D: Quasi experiment S: The total sampling is 50 respondents V: Health education and fluid adherence I: Data collection using the sociodemographic characteristics questionnaire, the dialysis diet, and fluid non-compliance questionnaire (DDFQ), and fluid control in the hemodialysis patient scale (FCHPS).	Measurements taken at the end of the education program revealed statistically significant differences in favor of the intervention group in terms of mean values for patient interdialytic body weight (kg), ultrafiltration volume, and diastolic blood pressure. Similarly, the average scores for the 4 items of the DDFQ questionnaire revealed statistically significant differences in favor of the intervention group regarding the frequency of diet nonadherence, rate of diet nonadherence, frequency of fluid restriction nonadherence, and rate of fluid restriction nonadherence. Conclusion: Monocentric work This suggests that establishing an educational program has a positive impact on patient adherence to dietary measures and fluid restriction.
10	Baser M, Mollaglu M	2019	Effects of a hemodialysis patient education program on fluid control and dietary compliance	D: Quasi experiment S: 78 respondents with 38 respondents as the intervention group and 40 respondents as the control group V: Education program and fluid control and dietary compliance I: sociodemographic characteristics questionnaire, dialysis diet and fluid nonadherence questionnaire (DDFQ), and fluid control in hemodialysis patients scale (FCHPS).	In the intervention group, decreases were observed in pre- and post-dialysis interdialytic weight gain, ultrafiltration volume (UF), and blood pressure values of patients after training. There was a statistically significant reduction in mean scores for the frequency and degree of nonadherence to dietary restriction, and for the frequency and degree of nonadherence to fluid restriction in participants in the intervention group compared to participants in the control group (P < 0.05). There was a statistically significant increase in mean scores obtained from the FCHPS and its subscales by participants in the intervention group compared to participants in the control group (P < 0.05). Conclusion: The training provided to hemodialysis patients positively contributed to their adherence to diet and fluid restriction. Patient adherence to diet and fluid restriction increased.
11	Tarek Mahmoud Shaker, Hanan Mohamed Badran and Amira Ahmed Hassanen	2017	Effect of Developed Nutrition Guidelines on Interdialytic Weight Gain among Hemodialysis Patients	D: Quasi experiment S: Purposive sample V: Nutrition guidelines and interdialytic weight gain values I: Nutritional assessment and IDWG score assessment observation sheet	The results reveal a significant increase in the knowledge of hemodialysis patients regarding the nutritional guidelines developed. There was a significant decrease in mean body mass index score, interdialytic weight gain, and serum sodium. There was a significant improvement in fluid adherence among hemodialysis patients following the application of the developed nutritional guidelines. This study concluded that the implementation of the nutritional guidelines developed had a positive effect in increasing the knowledge of hemodialysis

No	Author	Year	Title	Methods (Design, Sample, variables, Instruments, Analysis)	Research Results
					patients and reducing interdialytic weight gain. Recommendations include continuing knowledge evaluation and interdialytic weight gain among hemodialysis patients. The developed color booklet regarding nutritional guidelines should be made available to all hemodialysis patients.
12	Ok Lee Park, Sung Reul Kim	2019	The effect of an integrated self-management program in hemodialysis patients	D: Quasi experiment S: Total sampling of 84 patients, 42 patients as the intervention group and 42 patients as the control group. V: Self-efficacy, medication adherence, the ratio of interdialytic weight gain to dry weight, potassium and phosphorus levels I: Integrated program management A: Independent t-test and Mann-Whitney U test.	Self-efficacy scores and medication adherence were significantly higher in the experimental group. The ratio of interdialytic weight gain to dry weight decreased significantly in the experimental group, and serum potassium and phosphorus levels were not significantly lower between the experimental group and the control group.

DISCUSSION

All research articles reviewed, the authors differentiated the interventions provided in this study. Education-based interventions to improve dietary adherence, namely peer education research on interdialytic weight gain [20], family support-based health education [21], health education in improving dietary compliance and interdialytic weight gain [22], psychoeducation in reducing anxiety and increasing dietary adherence in CKD patients [11], the use of audiovisual media and leaflets in increasing adherence to the diet of CKD patients with hemodialysis programs [23], education about fluid control and diet [16], and diet management education programs and fluid restriction [17]. In addition, providing nutritional guidelines aimed at reducing the value of interdialytic weight gain in CKD patients with hemodialysis programs [18] and increasing self-efficacy for controlling the value of interdialytic weight gain [19]. This education has an important role in increasing knowledge and increasing compliance by

limiting fluid intake and management of dietary compliance that has been given by health workers to CKD patients undergoing hemodialysis programs. With good knowledge, it will be easy to accept advice on dietary and fluid restrictions to avoid complications from increasing interdialytic weight gain values. Even with a greater or broader knowledge of kidney diet in CKD patients, it was not associated with increased adherence to fluid and dietary restrictions [24] but the knowledge gained from education through various ways and means of supporting education is the basic capital that is needed by CKD patients. In addition, health education to increase knowledge about dietary compliance and fluid restriction, continuous motivation is needed to improve dietary adherence and positive clinical outcomes [25]. Many educational instruments can be used to help CKD patients to increase their knowledge about diet and fluid management to help CKD patients to live more optimally [26]. Other studies explain that there is no relationship between interdialytic weight gain, dietary compliance,

and family support on the quality of life of CKD patients undergoing hemodialysis programs [27]. But social support can affect adherence to diet and fluid restriction [28]. This social support is obtained from the association of fellow CKD patients, and the CKD patient community which can support optimizing the lives of CKD patients with hemodialysis programs. This is positive support considering that CKD patients will undergo hemodialysis therapy for the rest of their lives including good self-efficacy will make it easier for CKD patients to accept their condition and increase their enthusiasm for living rest of their lives with hemodialysis. Good motivation should be given by the people around him.

Interventions include using cell phones in managing diet and fluid adherence, as well as IDWG stability, namely preparation for discharge planning using applications as a reminder for fluid management and education management for CKD patients [29], the use of calendars and fluid management reminders using cell phones (SMS) in maintaining interdialytic weight gain in CKD patients [30] and the use of the IDWG calculator for the stability of interdialytic weight gain values in CKD patients on hemodialysis programs [14]. The use of technology that can be utilized in interventions to improve dietary adherence and limit fluid intake to maintain the stability of interdialytic weight gain values in the form of a mobile phone [31]. Currently, mobile phone-based applications can be accessed by CKD patients and their families. The use of mobile phones or applications is also feasible to be used as a means of controlling the

stability of interdialytic weight gain [32]. With stable IDWG values, complications that can worsen the condition of CKD patients with hemodialysis therapy can be avoided. There are many features contained in mobile phone applications that function to improve adherence to diet and fluid intake so that the quality of life of CKD patients undergoing hemodialysis can be even more optimal by avoiding complications. The convenience is offered by a mobile phone because this tool is easy to use and easy to carry anywhere so that patients and their families can easily access and use it so that the obstacles from the lack of access can be avoided. From this explanation, all research articles found that interventions in the form of health education were good with audio-visual facilities, leaflets, nutrition handbooks, peer education, family support.

CONCLUSION AND RECOMMENDATION

There are similarities, namely discussing the effect of IDWG and dietary adherence and restriction of fluid intake on CKD patients undergoing a hemodialysis program. Only the intervention differed in this study. It can be concluded that what influences the IDWG value is: reminder via mobile phone and calendar-based fluid management, supporting applications, IDWG calculator, and integrated self-management. Meanwhile, what influences dietary compliance in chronic kidney disease patients with hemodialysis programs is discharge planning with automatic fluid monitoring reminders, psychoeducation, education health based on

family support, education using audio-visual or leaflets, fluid management via reminders sent by cell phones, peer education, and education level. From this description, it can be concluded that dietary and fluid adherence in CKD patients with hemodialysis programs is related to the value of interdialytic weight gain. And the media used is very helpful in making CKD patients more compliant with dietary restrictions and fluid intake to maintain IDWG so that complications due to high IDWG values can be avoided. Suggestions to improve the CKD patient's condition using technology-based application that can be accessed at any time as a guide and reminder about diet and fluid management, medication management, activity management, and integrated medication management to improve the quality of life of CKD patients undergoing hemodialysis programs.

CONFLICT OF INTEREST

Authors disclose no conflicts of interest related to the work in this manuscript.

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