Factors Associated With Adherence to Fluid Restriction in Patients Undergoing Hemodialysis in Indonesia

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ABSTRACT

Background: The factors related to fluid intake adherence among patients undergoing hemodialysis have been explored in many studies. However, most of these were conducted in Western countries and have produced inconsistent results. A study of this issue in Indonesia, a tropical country with strong herbal medicine traditions, may show different results. In addition to demographic characteristics, self-efficacy is a standard measurement used in chronic care management activities such as hemodialysis treatment. Understanding the reasons behind patient nonadherence in Indonesia may help nurses better manage the fluid intake of patients.

Purpose: This study was designed to determine the factors that predict patient adherence to fluid intake restrictions.

Methods: A cross-sectional study was conducted on 153 patients undergoing hemodialysis at two hospitals. Intradialytic weight gain over a 1-month period was recorded to assess the participants’ adherence to fluid intake restrictions. Intradialytic weight gains of more than 2 kg was considered to be nonadherent. A daily urine output and level of thirst were also recorded. The participants completed an adapted self-efficacy questionnaire, Swedish Fluid Intake Appraisal Inventory, and the data were analyzed together with demographic characteristic and clinical parameters using hierarchical multiple regression.

Results: The results revealed that most of the respondents did not adequately adhere to fluid intake restrictions (59.5%). Intradialytic weight gain was shown to strongly correlate with self-efficacy ($p < .05$, $β = −.201$), gender ($p < .05$, $β = −.179$), educational background ($p = .05$, $β = .159$), and urine output ($p < .05$, $β = −.168$). Demographic characteristic explained 10.6% and self-efficacy explained 3.9% of the variance in fluid adherence.

Conclusions/Implications for Practice: Female participants with higher self-efficacy scores reported the lowest average level of intradialytic weight gain, indicating better adherence to fluid intake restrictions. Several demographic factors as well as self-efficacy were identified as potential predictors of fluid intake restriction adherence. Therefore, measuring self-efficacy periodically is a good initial step toward detecting those patients who are at higher risk of noncompliance with fluid intake restrictions.

Key Words: adherence, fluid restriction, hemodialysis, interdialytic weight gain (IDWG), self-efficacy.

Introduction

Chronic kidney disease (CKD) is a major health problem worldwide and is considered a key factor in poor health outcomes for most noncommunicable diseases, including cardiovascular disease, hypertension, and diabetes (Luyckx et al., 2018). CKD affects up to 13% of the world’s population, and its mortality rate is continuing to increase, especially in developing countries (GBD Chronic Kidney Disease Collaboration, 2020; Hill et al., 2016). The number of patients requiring renal replacement therapy, particularly hemodialysis (HD), also continue to increase over time. In Indonesia, HD is the most widely used treatment among patients with CKD (rate of usage among Indonesian patients with CKD is approximately 98%; Indonesian Renal Registry, 2018). Many previous studies have confirmed the high financial and physical burdens imposed by CKD. Because of the high costs associated with HD treatment, CKD has a significant and negative financial impact on the public healthcare system. Indonesian National Health Insurance ranks CKD as one of the top four diseases in terms of share of national healthcare expenditures (Social Insurance Administration Organization of Indonesia, 2020). Moreover, the decrease in patient income associated with repeated hospitalizations and physical limitations also increases health expenditures (Kerr et al., 2012; Kustimah et al., 2019).

Patients receiving HD are expected to adhere to recommended therapeutic regimens such as fluid restrictions, dietary guidelines, prescribed medications, and routine dialysis sessions to maintain their health, prevent complications, and improve quality of life (Lin et al., 2017; Naderifar et al., 2019). Previous studies have identified fluid restriction as the hardest regimen to follow (Mollaoğlu & Kayataş, 2015;
Ozen et al., 2019). Unrestricted fluid intake results in fluid accumulation, leading to more complications such as faster declining in estimated Glomerulo Filtration Rate, hypertension, and heart failure (Hung et al., 2015). Therefore, knowing the factors that contribute to adhering to fluid intake restrictions will be useful to help patients avoid more severe conditions.

Many studies have been conducted to identify the factors that contribute to fluid adherence behavior. Although sociodemographic characteristics such as age, gender, educational level, years on dialysis, social support, and perception of self-efficacy have been found to affect adherence to fluid intake restrictions, the degrees of effect vary across countries (Beerendrakumar et al., 2018; Chan et al., 2012; Khalil et al., 2013; Lee et al., 2014). Self-efficacy is a critical aspect in chronic disease management (Grady & Gough, 2014). Measuring self-efficacy is helpful in predicting patient adherence behavior with regard to some medication regimens such as fluid intake (Wu et al., 2016). Self-efficacy describes the expectation of an individual regarding their capacity in terms of a behavior or action to achieve a particular outcome (Bandura, 1977). Self-efficacy is not a personal characteristic but rather a judgment of self-confidence regarding the ability to accomplish some future task. Self-efficacy may be strengthened by nurses to enhance patients’ self-management efficacy in long-term treatments such as HD (Lindberg & Fernandes, 2010; Winters et al., 2012). Assessing self-efficacy, specifically with regard to fluid intake restrictions, will be very helpful for nurses as an initial step to assist patients to improve their fluid intake adherence.

Furthermore, sociocultural context should be highlighted to improve scholarly understanding of patient fluid adherence behaviors (Guerra-Guerrerro et al., 2014). Traditional Indonesian beliefs regarding medications must be assessed as a factor that affects fluid intake issues. Many patients in Indonesia with end-stage renal disease undergoing HD still use jamu, a traditional medicinal herbal beverage, as an alternative or complementary therapy (Kustimah et al., 2019). In addition to its accessibility and affordability, many Indonesian people perceive jamu as more natural and less harmful than modern, chemical-based drugs (Torri, 2013). Thus, approximately 44.3% Indonesian people still adhere to a combined Western medical and jamu treatment approach (The Indonesia Agency of Health Research and Development, 2018). However, natural herbs such as jamu pose a significant health risk to patients with failing renal function.

To date, no studies addressing the factors related to adherence to fluid intake limitations in Indonesian HD patients have been published. Prior studies have focused only on adherence to attendance in HD treatment (Agustina et al., 2019). Understanding the factors affecting adherence to fluid intake restrictions will help nurses improve health outcomes in patients undergoing HD. Therefore, this study was designed to determine the factors that significantly predict patient adherence to fluid intake restrictions.

Methods

Design

This was designed as a descriptive, cross-sectional study. Interdialytic weight gain (IDWG) over a 1-month period was recorded to determine adherence to fluid intake restrictions. Data on self-efficacy were collected using the Indonesian Fluid Intake Appraisal Inventory (I-FIAI).

Participants

One hundred fifty-three patients participated in this study, which was conducted during 2014. All of the participants were HD patients who regularly attended one of two HD units located in government hospitals in Yogyakarta. Participation was voluntary, and the participants were informed that all collected information would be anonymized and kept confidential.

Inclusion criteria were as follows: patients diagnosed with CKD Stage V, received HD for at least 6 months, more than 18 years old, and able to understand Bahasa. Otherwise qualified patients with a psychological disorder were excluded. Prior to enrollment, potential participants were given information about the research procedure. Patients were enrolled in the study only after they had provided written informed consent to the researcher.

Ethical Considerations

Ethical approval was obtained by the institutional research board of Universitas Gadjah Mada under Ethical Approval No. KE/FK/151/EC. Written informed consent was given by all participants following appropriate guidance. The written informed consent was sealed and coded to respect the participants’ privacy. Participants could withdraw from the study at any time.

Measures

Participants were approached during their dialysis sessions by the researcher and co-researchers. After consenting to participate, participants completed the questionnaire (demographic data sheet and I-FIAI). The urine output sheet was brought by the patients to record their daily urine output. The researcher recorded the IDWG for 1 month using a special form by inputting participants’ pre- and post-dialysis weights. Every sheet of the form contained the participant’s randomly assigned number, which corresponded to the demographic data form and questionnaire.

The following measures were included in the study questionnaire:

1. Demographic and clinical details

Age, gender, educational background, employment status, length of time on dialysis, dialysis hours per week, and jamu (Indonesian herbs) consumption were all recorded. A
visual analog scale was used to measure level of thirst. A special daily urine output record was completed by each patient.

2. Self-efficacy measure

A modified Swedish Fluid Intake Appraisal Inventory (S-FIAI) was used to measure self-efficacy in fluid intake restriction. The S-FIAI consists of 33 items and is framed on four situation-specific factors, including physiological, affective, social, and environmental (Lindberg et al., 2007). Compared to other scales designed to measure fluid adherence, the S-FIAI is currently the only one that focuses specifically on fluid adherence. This scale is a validated instrument with internal consistency (Cronbach’s α = .96 in the Swedish version) and has been translated and used in other languages such as Dutch (Cronbach’s α = .982) and Portuguese (Cronbach’s α = .95; Lindberg & Fernandes, 2010; Lindberg et al., 2007; Winters et al., 2012). Items are scored on an 11-point scale, ranging from 0 (not at all confident) to 10 (totally confident), based on the general question: “How do you assess your ability to limit your fluid intake on these following occasions?” The maximum possible raw score for this instrument is 330, with the sum of all item scores interpreted as the respondent’s level of self-efficacy. The content validity index values of .937 for the I-FIAI and .919 for the S-FIAI demonstrated the excellent content validity. The content validity index for the I-FIAI had five items that initially scored less than .85 and were subsequently modified. The mean content validity index values of .937 for the I-FIAI and .919 for the S-FIAI demonstrated the excellent content validity of this instrument. The internal consistency reliability for the I-FIAI, as tested using Cronbach’s alpha coefficient, was .952. Thus, the I-FIAI should be considered valid and reliable.

3. Measure of adherence

IDWG was recorded at every HD session as an objective measurement of fluid intake adherence. IDWG average values were obtained during HD sessions over a 1-month period. IDWG is a valid and reliable objective measure of fluid adherence and is used in both clinical and research settings. Patients were weighed before and after each dialysis session. IDWG was calculated by subtracting the individual’s predialysis weight in the current HD session from the postdialysis weight taken in the immediately preceding session (Hecking et al., 2018), with higher IDWG values indicating poorer adherence to fluid intake restrictions (Lindberg et al., 2007). In this study, the threshold for nonadherence was defined as having a 1-month mean IDWG value of > 2 kg (Association of Indonesian Nephrologists, 2011).

4. Level of thirst

Level of thirst was measured using a visual analog scale ranging from 0 to 10, with 0 indicating that the patient had perceived no thirst sensation over the previous 2 months and 10 indicating extreme thirst perception over the previous 2 months (Wirth & Folstein, 1982). Level of thirst was recorded at the same time the participants completed the self-efficacy questionnaire.

5. Urine output

Mean urine output was measured by summarizing the daily urine output (ml/day) recorded by patients over a 30-day period. A urine output of less than 100 ml/24 hours was considered as anuria (Kabbani, 2014).

Analysis

Analyses were performed using SPSS Windows Version 17 (SPSS, Inc., Chicago, IL, USA). Data were presented as means and standard deviations for the continuous data and as percentages for the categorical data. Each demographic characteristic, clinical indicator, and self-efficacy score were compared between adherent and nonadherent patients using an independent t test. Hierarchical multivariate linear regression analysis was used to determine the factors that influenced adherence to fluid intake, and any variables with a p value of ≤ .05 in the single comparisons were included in the regression analysis as candidates (i.e., gender, educational background, daily urine output, and self-efficacy). Statistical significance was defined at p < .05. In this final analysis, the dependent variable (patient adherence) was a continuous variable that was generated by IDWG and measured in kilograms.

Results

Sample Characteristics

A total of 153 patients from the HD units in two government hospitals in Yogyakarta were enrolled as participants in this study. As shown in Table 1, the mean age of the participants was 50.18 years (SD = 12.33), the male-to-female ratio was nearly equal (49.7:50.3), nearly half (46.4%) had completed compulsory education (secondary school) in Indonesia, and more than half were currently unemployed (64.7%). Almost all of the participants (92.8%) followed a twice-weekly HD schedule, with an average duration of HD treatment in the study sample of 36 months. Slightly more than half were anuric (52.3%), with nonadherent patients showing a significantly lower level of daily urine output (209.99 ml). Surprisingly, only 29 participants (19%) reported consuming jamu on a daily basis, whereas seven patients (4.5%) reported still consuming jamu sometimes. The mean level of
thirst was 5.64 on a scale of 1–10. The average hemoglobin level was 8.83 g/dl. Interestingly, regarding adherence to fluid intake level, the mean IDWG of all participants was 2.49 kg with more than half of the participants assessed as noncompliant with fluid intake restrictions (59.5%). The level of nonadherence to fluid intake restrictions, as determined using IDWG, is lower in Indonesia than other countries (Efe & Kocaöz, 2015).

**Self-Efficacy**

Using the I-FIAI instrument, total instrument scores for the participants ranged from 112 to 330, with a mean score of 228.73 (SD = 45.67; Table 2). Nonadherent participants earned self-efficacy scores (221.81 ± 44.24) that were significantly lower than their adherent peers (236.50 ± 50.09). Furthermore, with regard to the four specific factors related to self-efficacy, only the physiological factor was found to be significantly different between adherent and nonadherent participants (p = .02), with the latter scoring higher (71.27 ± 13.09).

Finally, to examine the strongest predictor of adherence to fluid intake restrictions after controlling for other significant factors, a two-step multiple hierarchical linear regression analysis was performed. Based on the results presented in Table 3, adding self-efficacy to the second model showed a statistical significance of the overall model, $F(5, 147) = 4.055, p < .05$. Demographic variables (gender, educational background, and urine output) explained 10.6% of the variance in fluid adherence. The main variable, self-efficacy, in Step 2 explained an additional 3.9% of variance in fluid nonadherence after controlling for other predictors ($β = −.201, p < .05$).

**Discussion**

The aim of the current research was to determine factors contributing to nonadherence to fluid intake restrictions, as

### Table 1

*Demographic and Clinical Data of Participants (N = 153)*

| Characteristic | Total (n = 153) | Adherent (n = 62) | Nonadherent (n = 91) | t/χ² | p |
|----------------|----------------|------------------|----------------------|-----|---|
| **n %** | **n %** | **n %** |
| **Age (years), M and SD** | 50.18 12.33 | 51.82 11.47 | 48.95 12.63 | t = 1.42 | .15 |
| **Gender** | | | | | |
| Male | 76 49.7 | 24 38.7 | 52 57.1 | 10.75 | .03 * |
| Female | 77 50.3 | 38 61.3 | 39 42.9 | | |
| **Education** | | | | | |
| Primary school | 52 33.99 | 29 26.8 | 23 25.3 | 5.01 | .03 * |
| Secondary school | 71 46.41 | 24 38.7 | 47 51.6 | | |
| Higher education | 30 19.60 | 9 14.5 | 21 23.1 | | |
| **Employment** | | | | | |
| Unemployed | 99 64.7 | 44 70.9 | 55 60.5 | 3.44 | .17 |
| Employed | 54 35.3 | 18 29.1 | 36 39.5 | | |
| **Frequency of HD/week** | | | | | |
| 2×/week | 142 92.8 | 59 95.2 | 83 91.2 | 1.62 | .44 |
| Other | 11 7.2 | 3 4.8 | 8 8.8 | | |
| **Herbs consumption** | | | | | |
| Yes | 29 19.0 | 7 11.3 | 22 24.2 | 0.53 | .48 |
| No | 117 76.5 | 54 87.1 | 63 69.2 | | |
| Sometimes | 7 4.5 | 1 1.6 | 6 6.6 | | |
| **Urine output (ml), M and SD** | 231.35 296.95 | 262.69 294.82 | 209.99 296.11 | 3.93 | .04 * |
| < 100 | 80 52.3 | 27 43.5 | 53 58.2 | | |
| ≥ 100 | 73 47.7 | 35 56.5 | 38 41.8 | | |
| **Mean SD** | **Mean SD** | **Mean SD** | **t** | **p** |
| IDWG (kg) | 2.49 1.09 | 1.49 0.66 | 3.1 0.76 | −14.21 | < .001 |
| Duration of HD (month) | 36.00 34.84 | 31.85 32.64 | 38.54 36.29 | −1.16 | .24 |
| Thirst level (0–10) | 5.64 1.82 | 5.42 1.68 | 5.69 1.98 | −0.89 | .37 |
| Hemoglobin (g/dl) | 8.83 1.32 | 8.35 1.29 | 8.41 1.36 | −0.25 | .80 |

Note. IDWG = interdialytic weight gain; HD = hemodialysis.

*p < .05.*
Patients on HD regularly struggle to control the temptation to drink fluids and must learn to live with fluid intake limitations for the rest of their lives. Therefore, identifying potential factors associated with self-efficacy and developing interventions to enhance self-efficacy should offer a better solution for the long term.

Compared to the patients in studies conducted in European countries, patients undergoing HD in Indonesia exhibited better self-efficacy (Lindberg & Fernandes, 2010; Lindberg et al., 2007; Winters et al., 2012). Indonesian people hold a strong traditional belief called nrimo, which encourages them to accept their fate (Murtisari, 2013). This belief helps Indonesian people face all “God-ordained” situations with a good attitude. These situations include strict regimens prescribed by health providers. Furthermore, in terms of the situation-specific factors, self-efficacy in the physiological factor dimension was better in the nonadherent participants than their adherent peers. The physiological items represent situations with treatment-related symptoms, swallowing foods, and physical sensations such as thirst, salty taste, and breathlessness (Lindberg et al., 2007). The nonadherent participants were more confident in their ability to avoid drinking in the face of thirst, dry mouth, or in the aftermath of consuming salty food. They interpreted the thirst sensation as a sign for them to limit fluid intake. Physiological indicators have previously been highlighted as important in modifying self-efficacy. Furthermore, according to Bandura, some people consider their physical and emotional states as factors that may bolster their performance on certain behaviors (Bandura, 1994).

In addition to self-efficacy, gender has been suggested as a significant predictor in fluid intake adherence. In this study, average IDWG scores were higher in male participants than female participants. This finding is similar to those of several prior studies (Beerendrakumar et al., 2018; Ozen et al., 2019). The male participants in this study showed poorer adherence to fluid intake restrictions, possibly because men are generally less aware of their health status than women. Frequently, Indonesian male patients ignore medical advice and have a relatively low rate of participation in health checkups (Intarti & Khoriah, 2018). Moreover, men are

To strictly comply with fluid intake restrictions, patients undergoing HD must compensate not only for external factors but also for personal perceptions, including self-efficacy (Lin et al., 2017). Patients on HD regularly struggle to control the temptation represented by IDWG, in patients undergoing HD. The results showed that most of the participants in this study were noncompliant. In general, female patients with better self-efficacy had less intradialytic weight gain, indicating better adherence to fluid intake restrictions.

As predicted, self-efficacy was found to be the most important predictor of fluid adherence. Patients with higher self-efficacy had lower IDWG. These results are consistent with previous studies of self-efficacy and health-related behaviors, in which self-efficacy was found to be the most important predictor of behavior (Agustina et al., 2019; Brady et al., 2007; Winters et al., 2012). Indonesian people hold a strong traditional belief called nrimo, which encourages them to accept their fate (Murtisari, 2013). This belief helps Indonesian people face all “God-ordained” situations with a good attitude. These situations include strict regimens prescribed by health providers. Furthermore, in terms of the situation-specific factors, self-efficacy in the physiological factor dimension was better in the nonadherent participants than their adherent peers. The physiological items represent situations with treatment-related symptoms, swallowing foods, and physical sensations such as thirst, salty taste, and breathlessness (Lindberg et al., 2007). The nonadherent participants were more confident in their ability to avoid drinking in the face of thirst, dry mouth, or in the aftermath of consuming salty food. They interpreted the thirst sensation as a sign for them to limit fluid intake. Physiological indicators have previously been highlighted as important in modifying self-efficacy. Furthermore, according to Bandura, some people consider their physical and emotional states as factors that may bolster their performance on certain behaviors (Bandura, 1994).

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generally more physically active and thus require more caloric and water intake than women (Riskesdas, 2019). These hegemonic masculinities may have influenced the negative results found in this study for the male participant in terms of excessive consumption of both water and liquids (Peak & Gast, 2014).

An interesting result was found for the educational background factor, with more highly educated part exhibiting higher IDWG scores. This result is the opposite of previous studies (Khalil et al., 2013; Mollaoglu & Kayataş, 2015; Ozen et al., 2019) that found more years of education decreased the IDWG score. In behavioral change theory, educational level often acts as a mediator rather than an influencing factor in adherence to medical treatment (Margolis, 2013). However, when assessed together with other significant factors such as self-efficacy using multivariate analysis, educational background was no longer a significant predictor. The results of further analysis suggested that an intercorrelation exists between educational background, self-efficacy, and fluid adherence. Besides being associated with IDWG, an independent t test showed that patients with higher education had lower self-efficacy. The strong association between educational background and self-efficacy likely affected the relationship between educational background and fluid adherence in this study.

The analysis in this study found an association between lower daily urine output and higher IDWG, which is consistent with previous studies (Dantas et al., 2013; Lee et al., 2014). Urine output as one factor of fluid adherence implies that patients with anuria have more difficulties complying with fluid restrictions and are thus more prone to nonadherence. Moreover, a previous study suggested that urine output is a clinical indicator of residual renal function and also plays an important role in IDWG, with more urine output associated with both lower IDWG scores and a better survival rate (Hecking et al., 2019). Therefore, conducting an initial assessment of residual urine output may be helpful to identifying patients at significant risk of nonadherence.

Contrary to expectations, jamu consumption as a cultural issue was found to be nonsignificantly associated with IDWG. Nearly one quarter of the participants in this study consumed jamu on a daily basis, which is in line with a previous study that also found only a few patients with CKD drank herbal drinks (Indrayanti et al., 2019). Even though most Indonesians are satisfied with the effects of jamu (Elfahmi et al., 2014), this study found that three quarters of participants avoided consuming this beverage. Most patients undergoing HD avoid herbal drinks as a daily beverage because of concerns over potentially negative effects such as excessive fluid volumes and shortness of breath (Kustimah et al., 2019).

In summary, the results of this study suggest that, in addition to demographic factors, self-efficacy is a potential predictor of fluid intake restriction adherence in patients receiving HD. Therefore, measuring self-efficacy is a good initial step toward detecting which patients are at risk of poor fluid intake restriction adherence. Evaluating self-efficacy on a regular basis is highly recommended for nurses in the field of nephrology, as self-efficacy may change over time. Furthermore, further studies should be conducted to identify which interventions targeting the promotion of self-efficacy are the best options for improving patient adherence to fluid intake restrictions, particularly ones that help enhance physiological-specific self-efficacy, as most participants in this study were not sufficiently confident to limit their fluid consumption because of physiological changes in their body.

**Conclusions**

The findings of this study support self-efficacy and gender as the strongest predictors of fluid intake restriction adherence in patients receiving HD in Indonesia. Patients who are female and have higher self-efficacy scores tend to comply better with these restrictions. The findings of this study may be used by nurses as a reference for placing greater attention on male patients to promote appropriate control of their fluid intake. Moreover, self-efficacy seems to be a promising concept that may be improved to further increase adherence to fluid intake restrictions. Measuring self-efficacy on a periodic basis may be a good initial step in detecting those patients who are most at risk of noncompliance with fluid intake restriction.

**Author Contributions**

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Data analysis and interpretation: MP, MY
Drafting of the article: MP, MY
Critical revision of the article: MY

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**References**

Agustina, F., Yetti, K., & Sukmarini, L. (2019). Contributing factors to hemodialysis adherence in Aceh, Indonesia. Enfermería Clínica, 29(2), Suppl., 238–242. https://doi.org/10.1016/j.enfcli.2019.04.028

Association of Indonesian Nephrologists. (2011). Nutritional consensus on patients with chronic kidney disease. PERNEFRI. (Original work published in Indonesian)

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. Psychological Review, 84, 191–215. https://doi.org/10.1037/0033-295X.84.2.191
Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behaviour* (Vol. 4, pp. 71–81). Academic Press.

Beerendrakumar, N., Ramamoorthy, L., & Haridasa, S. (2018). Dietary and fluid regime adherence in chronic kidney disease patients. *Journal of Caring Sciences*, 7(1), 17–20. https://doi.org/10.15171/jcsp.2018.003

Brady, B. A., Tucker, C. M., Alfinio, P. A., Tarrant, D. G., & Finlayson, G. C. (1997). An investigation of factors associated with fluid adherence among hemodialysis patients: A self-efficacy theory based approach. *Annals of Behavioural Medicine*, 19, 339–343. https://doi.org/10.1007/BF02895151

Chan, Y. M., Zalilah, M. S., & Hii, S. Z. (2012). Determinants of compliance behaviours among patients undergoing hemodialysis in Malaysia. *PLOS ONE*, 7(6), Article e41362. https://doi.org/10.1371/journal.pone.0041362

Dantas, L. G., Cruz, C., Rocha, M., Moura, J. A. Jr., Paschoalin, E., Paschoalin, S., & Marcilio de Souza, M. (2013). Prevalence and predictors of nonadherence to hemodialysis. *Nephron Clinical Practice*, 124(1-2), 67–71. https://doi.org/10.1159/000355866

Efe, D., & Kocaöz, S. (2015). Adherence to diet and fluid restriction of individuals on hemodialysis treatment and affecting factors in Turkey. *Japanese Journal of Nursing Science*, 12, 113–123. https://doi.org/10.1111/jjns.12055

Elfahmi, Woerdenbag, H. J., & Kayser, O. (2014). Jamu: Indonesian traditional herbal medicine towards rational phytopharmaceutical use. *Journal of Herbal Medicine*, 4(2), 51–73. https://doi.org/10.1016/j.hermed.2014.01.002

GBD Chronic Kidney Disease Collaboration. (2020). Global, regional, and national burden of chronic kidney disease, 1990–2017: A systematic analysis for the Global Burden of Disease Study 2017. *The Lancet*, 395(10225), 709–733. https://doi.org/10.1016/S0140-6736(20)30045-3

Grady, P. A., & Gough, L. C. (2014). Self-management: A comprehensive approach to management of chronic conditions. *American Journal of Public Health*, 108, 430–436. https://doi.org/10.2105/AJPH.2014.302041r

Guerra-Guerrero, V., Plazas Mdel, P., Cameron, B. L., Santos Salas, A. V., & González, C. G. (2014). Understanding the life experience of people on hemodialysis: Adherence to treatment and quality of life. *Nephrology Nursing Journal*, 41(3), 289–298.

Hecking, M., McCullough, K. P., Port, F. K., Bieber, B., Morgenstern, H., Yamamoto, H., Suri, R. S., Jadoul, M., Gesualdo, L., Perl, J., & Robinson, B. M. (2019). Self-reported urine volume in hemodialysis patients: Predictors and mortality outcomes in the international Dialysis Outcomes and Practice Patterns Study (DOPPS). *American Journal of Kidney Disease*, 74(3), 425–428. https://doi.org/10.1053/j.ajkd.2019.02.012

Hung, S.-C., Lai, Y.-S., Kuo, K.-L., & Trang, D.-C. (2015). Volume overload and adverse outcomes in chronic kidney disease: Clinical observational and animal studies. *Journal of the American Heart Association*, 4(6), Article e001918. https://doi.org/10.1161/JAHA.115.001918

Indonesian Renal Registry. (2018). 11th Report of Indonesian renal registry 2018. https://www.indonesianrenaldregistry.org/data/RR%202018.pdf (Original work published in Indonesian)

Indrayanti, S., Ramadaniati, H., Anggriani, Y., Sarnianto, P., & Andayani, N. (2019). Risk factors for chronic kidney disease: A case-control study in a district hospital in Indonesia. *Journal of Pharmaceutical Sciences and Research*, 1(7), 2549–2554.

Intarti, W. D., & Khoriah, S. N. (2018). Factors associated with participation in elderly community services. *Journal of Health Studies*, 2(1), 110–122. http://doaj.org/toc/2549-3353 (Original work published in Indonesian)

Kabbani, A. R. (2014). Oliguria/anuria. In A. Merseburger, M. Kuczyn, & J. Moul (Eds.), *Urology at a glance*. Springer. https://doi.org/10.1007/978-3-642-54858-8_25

Kerr, M., Bray, B., Medvalf, J., O’Donoghue, D. J., & Matthews, B. (2012). Estimating the financial cost of chronic kidney disease to the NHS in England. *Nephrology Dialysis Transplantation*, 27(3), Suppl.1, iii73–iii80. https://doi.org/10.1093/ndt/dfs269

Khaliil, A. A., Darawad, M., Al Gamal, E., Hamdan-Mansour, A. M., & Abed, M. A. (2013). Predictors of dietary and fluid non-adherence in Jordanian patients with end-stage renal disease receiving haemodialysis: A cross-sectional study. *Journal of Clinical Nursing*, 22(1-2), 127–136. https://doi.org/10.1111/j.1365-2702.2012.04117.x

Krespi-Boothby, M. R., & Salmon, P. (2013). Self-efficacy and haemodialysis treatment: A qualitative and quantitative approach. *Turkish Journal of Psychiatry*, 24(2), 84–93.

Kustimah, K., Siswadi, A. G. P., Djunaidi, A., & Iskandarsyah, A. (2019). Factors affecting non-adherence to treatment in end stage renal disease (ESRD) patients undergoing haemodialysis in Indonesia. *The Open Psychology Journal*, 12, 141–146. https://doi.org/10.2174/1874350101912010141

Lee, M. J., Doh, F. M., Kim, C. H., Koo, H. M., Oh, H. J., Park, J. T., Han, S. H., Yoo, T.-H., Kim, Y.-L., Kim, Y. S., Yang, C. W., Kim, N.-H., & Kang, S.-W. (2014). Interdialytic weight gain and cardiovascular outcome in incident haemodialysis patients. *American Journal of Nephrology*, 39, 427–435. https://doi.org/10.1159/000362743

Lin, M.-Y., Liu, M. F., Hsu, L.-F., & Tsai, P.-S. (2017). Effects of self-management on chronic kidney disease: A meta-analysis. *International Journal of Nursing Studies*, 74, 128–137. https://doi.org/10.1016/j.ijnurstu.2017.06.008

Lindberg, M., & Fernandes, M. A. M. (2010). Self-efficacy in relation to limited fluid intake amongst Portuguese haemodialysis patients. *Journal of Renal Care*, 36(3), 133–138. https://doi.org/10.1111/j.1755-6868.2010.00182.x

Lindberg, M., Wikström, B., & Lindberg, P. (2007). Fluid Intake Appraisal Inventory: Development and psychometric evaluation of a situation-specific measure for haemodialysis patients’ self-efficacy to low fluid intake. *Journal of Psychosomatic Research*, 63(2), 167–173. https://doi.org/10.1016/j.jpsychores.2007.03.013

Luyckx, V. A., Tonelli, M., & Stafanier, J. W. (2018). The global burden of kidney disease and the sustainable development goals. *Bulletin of the World Health Organisation*, 96(6), 414–422D. https://doi.org/10.2471/BLT.17.206441
Margolis, R. (2013). Educational differences in healthy behavior changes and adherence among middle-aged Americans. *Journal of Health and Social Behaviour, 54*(3), 353–368. https://doi.org/10.1177/0022146513489312

Ministry of Health, Indonesia. (2019). *National report: Riskesdas 2018*. Health Research and Development Agency.

Mollağlu, M., & Kayatăş, M. (2015). Disability is associated with nonadherence to diet and fluid restrictions in end-stage renal disease patients undergoing maintenance hemodialysis. *International Urology & Nephrology, 47*(11), 1863–1870. https://doi.org/10.1007/s11255-015-1102-1

Murtisari, T. M. (2013). Some traditional Javanese values in NSM: From God to social interaction. *International Journal of Indonesian Studies, 1*, 110–125. https://arts.monash.edu/__data/assets/pdf_file/0010/1793611/6-Elisabeth.pdf

Naderifar, M., Tafreshi, M. Z., Ilkhani, M., Akbarizadeh, M. R., & Ghaljaei, F. (2019). Correlation between quality of life and adherence to treatment in hemodialysis patients. *Journal of Renal Injury Prevention, 8*(1), 22–27. https://doi.org/10.15171/jrip.2019.05

Ozen, N., Cinar, F. I., Askin, D., Mut, D., & Turker, T. (2019). Nonadherence in hemodialysis patients and related factors: A multicentre study. *The Journal of Nursing Research, 27*(4), Article e36. https://doi.org/10.1097/jnr.0000000000000309

Peak, T., & Gast, J. A. (2014). Aging men’s health-related behaviors. *SAGE Open, 4*(4), 1–10. https://doi.org/10.1177/2158244014558044

Social Insurance Administration Organization of Indonesia. (2020). *Annual program and financial report 2019*. https://bpjs-kesehatan.go.id/bpjs/arsip/categories/MzA/publikasi (Original work published in Indonesian)

The Indonesia Agency of Health Research and Development. (2018). *Basic health research 2018*. Ministry of Health, Indonesia. (Original work published in Indonesian)

Torri, M. C. (2013). Knowledge and risk perceptions of traditional jamu medicine among urban consumers. *European Journal of Medicinal Plants, 3*(1), 25–39. https://doi.org/10.9734/EJMP/2013/1813

Winters, A. M., Lindberg, M., & Sol, B. G. (2012). Validation of a Dutch self-efficacy scale for adherence to fluid allowance among patients on haemodialysis. *Journal of Renal Care, 39*(1), 31–38. https://doi.org/10.1111/j.1755-6686.2012.00325.x

Wirth, J. B., & Folstein, M. F. (1982). Thirst and weight gain during maintenance hemodialysis. *Psychosomatics, 23*(11), 1134–1131. https://doi.org/10.1016/S0033-3182(82)73279-7

Wu, S.-F., Hsieh, N.-C., Lin, L.-J., & Tsai, J.-M. (2016). Prediction of self-care behaviour on the basis of knowledge about chronic kidney disease using self-efficacy as a mediator. *Journal of Clinical Nursing, 25*(17–18), 1609–1618. https://doi.org/10.1111/jocn.13305