JENDELA NURSING JOURNAL
Volume 7, Number 1, June 2023, 20-29

# Factors Affecting Interdialytic Weight Gain (IDWG) in Kidney Failure

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## ABSTRACT

**Background:** interdialytic Weight Gain (IDWG) is a parameter easily measured routinely at the beginning of a dialysis session and an essential indicator to recommend fluid intake for patients with kidney failure. Increased IDWG is associated with various complications in patients undergoing hemodialysis.
**Purpose:** to analyze the factors that influence IDGW in hemodialysis patients.
**Methods:** a cross-sectional design was used in this study. Data were collected during January-March 2022. Data collected included: demographic variable (gender, age, level of education, fluid intake, thirst, and stress)/ Data were analyzed with descriptive correlation statistic, Simple regression analysis & ANOVA.
**Results:** the total number of participants recruited was 65 participants who undergoing hemodialysis > 1 month at a private hospital in Semarang, there were 27 participants (41.5%) in the moderate IDGW category, and 20 participants (30.8%) experienced severe stress, while fluid intake had an influence on IDGW (r=0.493, p=0.000), thirst (r=0.394, p=0.001) and stress (r=0.562, p=0.000).
**Conclusion:** in this study, the factors associated with IDWG were fluid intake, thirst and stress. The previous 3 factors significantly increased IDWG due to decreased renal function, but increased fluid intake interfered with patient compliance, including fluid management and hemodialysis. Factors not included in IDWG include age, gender and education.

**Keywords**:
IDWG; fluid intake; thirst; stress.

## BACKGROUND

Kidney failure patients undergoing hemodialysis are very important to monitor Interdialytic Weight Gain (IDWG) (Juliardi et al., 2020). IDWG is an increase in fluid volume that is manifested by an increase in body weight as a basis for knowing the amount of fluid that enters during the interdialytic period (Mohamed et al., 2018). IDWG that can be tolerated by the body is not more than 3% dry body weight. IDWG is measured based on the patient's dry weight and also from measurements of the patient's clinical condition (Mustikasari & Noorratri, 2017). IDWG measurements were carried out after HD 1 and before HD 2 according to the patient's schedule for hemodialysis. If the IDWG exceeds 4.8%, mortality will increase. The higher the IDWG, the greater the amount of excess fluid in the patient's body and the higher the risk of complications, including hypotension, muscle cramps, shortness of breath, nausea and vomiting (Bayhakki & Hasneli, 2017).

The increase in IDWG can be influenced by several factors including age, gender, and education (Mustikasari & Noorratri, 2017), fluid intake, thirst and stress (Istanti, 2011). Based on studies Fazriansyah et al., (2018) mainly (70.8%) of the respondents experienced moderate weight gain. Based on study Saswati et al., (2020) the majority of respondents had a moderate Interdialytic Weight Gain (IDWG) value of 56% and this is in line with research Khairidina et al., (2020) as many as 72.5% showed an increase in IDWG ≥ 3%, so most patients with kidney failure undergoing hemodialysis experienced an increase in Interdialytic Weight Gain (IDWG). An increase in IDWG has a serious impact on patients with kidney failure undergoing hemodialysis such as hypertension, (Sobhi et al., 2021), malnutrition (Kahraman et al., 2015) and hypotension (Juliardi et al., 2020).

## OBJECTIVE

To analyze the factors that affect the increase in IDWG, to prevent significant weight gain.

## METHODS

The type of study used is descriptive correlation with a cross sectional approach. The research was conducted at RSI Sultan Agung Semarang. The sample to be used in this study is 65 people. The sampling technique is non-probability sampling with purposive sampling technique. The inclusion criteria for this study were chronic kidney failure patients undergoing hemodialysis routinely at RSI Sultan Agung Semarang, at least 25 years old with composmentis awareness (with a GCS range of 14-15) who had undergone hemodialysis > 1 month and were able to stand independently to weigh their weight. . Exclusion criteria included: patients who experienced decreased consciousness during data collection, mental disorders or had psychosocial problems or refused to be respondent.

Instruments for this study include the Visual Analogue Scale (VAS) with a measurement scale in the range of 0-10. VAS scores are classified into mild thirst (1-3), moderate thirst (4-6), and severe thirst (7-10), validity of this study (r = 0.8768) with a high validity category with r cronbach's alpha = 0.777.
Anxiety Stress Scales (DASS), categorized 0 = never, 1 = rarely, 2 = often and 3 = always, categorized into 5 to determine the level of stress, with values: Normal (0-14), Mild stress

(15-18), moderate stress (19-25), severe stress (26-33) and very severe stress (> 34), validity r result = 0.4237, with r cronbach's alpha = 0.723. IDWG measurements were carried out using a GEA Medical brand weight scale, type EB 1623, no. JW0920/08/19 series, with no. Calibration certificate 01.110.051A.PAK.2022.0014.

This research was conducted after obtaining ethical qualification from RSI Sultan Agung Semarang with number of ethics 22/KEPK-RSISA/II/2022.Analysis using IBM SPSS. Data displayed in the form of frequency, percentage, mean and SD for categorical data. Bivariate analysis in this study was carried out using a simple linear regression test for age, fluid intake, thirst and stress. ANOVA for gender and education. Independent variables are age, gender, education, fluid intake, thirst, stress. The dependent variable is the interdyalitic weight gain

## RESULTS

There were 65 respondents underwent hemodialysis at RSI Sultan Agung Semarang who participated in this study. There were 21 older adults (32.3%) with a mean of 49.89 (SD 10.922), most of whom were male, 35 people (53.8%) with a mean of 1.46 (SD 0.502) . Most of them had primary school education of 22 people (33.8%) with a mean of 3.14 (SD 1.171) and the dominant fluid intake in the excess category was around 57 people (87.7%) with a mean of 906.08 (SD 519.456). The thirst felt by the respondents in the medium category was more, around 42 people (64.6%) with a mean of 5.23 (SD 2.006). SD 9.443) with moderate IDWG category as many as 27 people (41.5%) with a mean of 4.46 (SD 2.352).

**Tabel 1.** Characteristics of respondents analysis of factors affecting IDWG in chronic kidney failure

| Variable | f | % | Mean | SD |
|---|---|---|---|---|
| Age | | | 49,89 | 10,922 |
| Early adulthood (25-35 y.o) | 8 | 12,3 | | |
| Late adulthood (36-45 y.o) | 14 | 21,5 | | |
| Early Elderly (46-55 y.o) | 21 | 32,3 | | |
| Late Elderly (56-65 y.o) | 20 | 30,8 | | |
| Senior Elderly (>65 y.o) | 2 | 3,1 | | |
| Gender | | | 1,46 | 0,502 |
| Man | 35 | 53,8 | | |
| Women | 30 | 46,2 | | |
| Education | | | 3,14 | 1,171 |
| No Studying | 3 | 4,6 | | |
| Elementary school | 22 | 33,8 | | |
| Junior High School | 12 | 18,5 | | |
| Senior High School | 19 | 29,2 | | |
| University | 9 | 13,8 | | |
| Fluid Intake | | | 906,08 | 519,456 |
| Less (*intake<output*) | 3 | 4,6 | | |
| Adequate (*intake=output*) | 5 | 7,7 | | |
| Overload (*intake>output*) | 57 | 87,7 | | |

| Variable | f | % | Mean | SD |
|---|---|---|---|---|
| Thirsty | | | 5,23 | 2,006 |
| Normal (0) | 8 | 12,3 | | |
| Mild (1-3) | 2 | 3,1 | | |
| Moderate (4-6) | 42 | 64,6 | | |
| Severe (7-10) | 13 | 20,0 | | |
| Stress | | | 27,35 | 9,443 |
| Normal (0-14) | 10 | 15,4 | | |
| Mild (15-18) | 4 | 6,2 | | |
| Moderate (19-25) | 15 | 23,1 | | |
| Severe (26-33) | 16 | 24,6 | | |
| Very Severe (>34) | 20 | 30,8 | | |
| IDWG | | | 4,46 | 2,352 |
| Normal (<1%) | 2 | 3,1 | | |
| Mild (1-<4%) | 19 | 29,2 | | |
| Severe (4-6%) | 27 | 41,5 | | |
| Severe (>6%) | 17 | 26,2 | | |

**Table 2.** Corelation between age, fluid intake, thirst and stress with (IDWG) in the analysis of factors affecting IDWG in chronic kidney failure (n=65)

| Variabel | R | $r^2$ | Line equation | *p-value* |
|---|---|---|---|---|
| Age | 0,062 | 0,004 | IDWG=3,79+0,01*x | 0,623 |
| *Fluid intake* | 0,493 | 0,243 | IDWG=2,44+2,23E-3*x | 0,000 |
| Thirsty | 0,394 | 0,155 | IDWG=2,04+0,46*x | 0,001 |
| Stress | 0,562 | 0,316 | IDWG=0,63+0,14*x | 0,000 |

**Table 3**. Corelation between gender and education with interdyalitic weight gain (idwg) in the analysis of factors affecting interdyalitic weight gain (idwg) in chronic kidney failure (n=65)

| Variable | N | Mean | SD | SE | *F* | *p-value* |
|---|---|---|---|---|---|---|
| Gender | | | | | 0,520 | 0,473 |
| Man | 35 | 4,66 | 2,600 | 0,440 | | |
| Women | 30 | 4,23 | 2,046 | 0,373 | | |
| | | | | | | |
| Pendidikan | | | | | | |
| No study | 3 | 2,67 | 1,155 | 0,667 | | |
| Elementary | 22 | 4,59 | 1,968 | 0,420 | | |
| Junior High School | 12 | 4,50 | 2,355 | 0,680 | | |
| Senior High School | 19 | 4,79 | 1,843 | 0,423 | | |
| University | 9 | 4,00 | 4,093 | 1,364 | | |

There is no significant relationship between age and IDWG (r=0.062, p value=0.623). The coefficient of determining age is 0.4%, meaning that age determines 0.4% of the IDWG, the remaining 99.96% is determined by other factors. There is a significant relationship between fluid intake and IDWG (r=0.493, p-value=0.000). The determining coefficient of fluid intake is 24.3%, meaning that fluid intake determines 24.3% IDWG, the remaining 75.7% is determined by other factors. there is a significant relationship between thirst and IDWG (r=0.394, p-value=0.001). The thirst determinant coefficient is

15.5%, meaning that thirst determines 15.5% IDWG, the remaining 84.5% is determined by other factors.

There is a significant relationship between stress and IDWG (r=0.562, p-value=0.000). The magnitude of the stress determinant coefficient is 31.6%, meaning that stress determines 31.6% IDWG, the remaining 68.4% is determined by other factors. the average IDWG in men is higher (4.66). After performing the ANOVA statistical test, it was concluded that there was no significant relationship between gender and IDWG (p-value=0.473, α=0.05). the highest IDWG average is elementary education (4.59). After conducting the ANOVA statistical test, it was concluded that there was no significant relationship between education and IDWG (p-value=0.651, α=0.05).

**DISCUSSION**

In the present study, there is no significant relationship between age and IDWG with a value of r=0.062 (p-value=0.623). The coefficient of determining age is 0.4%, meaning that age determines 0.4% of the IDWG, the remaining 99.96% is determined by other factors. This result is in line with the study of Mustikasari & Noorratri (2017) with the result that there is no significant effect of age on interdialytic weight gain (IDWG) in hemodialysis patients with a p-value = 0.77. Strengthened by the research of Natashia et al. (2019) found that there was no significant relationship between age and IDWG with a value of r = 0.01 p-value = 0.872. It is not different from the results of Priska & Herlina's research (2019) that there is no relationship between age and IDWG with a p-value = 0.405. At an older age, it is not certain that the IDWG will increase if it is not supported by knowledge and experience. An increase in IDWG can occur at any age. Non-compliance that has an impact on increasing IDWG is seen as negligence and a lack of self-control and mastery of the environment and not based on the influence of age (Istanti, 2011).

Our results showed this study showed that there was a significant relationship between fluid intake and IDWG (r=0.493, p-value=0.000). The determining coefficient of fluid intake is 24.3%, meaning that fluid intake determines 24.3% IDWG, the remaining 75.7% is determined by other factors. These results are in line with Istianti's research (2014) that there is a significant relationship between fluid intake and IDWG (r=0.541, p-value=0.000). Corroborated by research by Hecking et al. (2013) found that there was a relationship between excess fluid intake and IDWG with p <0.0001. Not unlike the research by Fazriansyah et al. (2018) that (p = 0.000) with a 95% confidence level (α = 0.05) that there is a relationship between adherence to controlling fluid intake and the addition of the interdialytic weight gain (IDWG) value in patients undergoing hemodialysis therapy. The average daily fluid intake of respondents has a tendency to exceed the recommended fluid intake. Several respondents claimed to be able to comply with the rules for fluid intake, because if they do not comply it usually results in dizziness, shortness of breath, edema and hypertension. But most of the respondents said they couldn't hold back their thirst so they didn't care about the rules for fluid intake that they had to drink every day (Istianti, 2014). Intake of fluids and food during the interdialytic period will increase the volume of extracellular water due to decreased kidney function which cannot maintain homeostasis. As a result, weight gain of several kilograms and usually the greatest fluid overload occurs during the interval between hemodialysis which

is characterized by decreased urine output, intradialytic cramps, fatigue, dizziness, lower extremity edema, ascites, dry, scaly skin, thin and brittle nails, thin hair and rough, bruised (purpura), these symptoms arise due to metabolic wastes being stuck in the body which should be excreted through urine (Siam et al., 2019).

The results of statistical tests in this study showed that there was a significant relationship between thirst and IDWG (r=0.394, p-value=0.001). The thirst determinant coefficient is 15.5%, meaning that thirst determines 15.5% IDWG, the remaining 84.5% is determined by other factors. These results are in line with research by Lina & Wahyu (2019) where there is a significant relationship between thirst and IDWG with a p value of 0.001 (<0.05). Corroborated by research by Fan et al. (2013) found that there was a positive relationship between thirst and IDWG (r=0.315, p=0.042). CRF patients undergoing hemodialysis experience difficulties in controlling their thirst due to limitation of fluid intake. CRF patients, even though they are hypervolemic, often feel a strong thirst, this thirst stimulates the client to increase fluid intake. Thirst is caused by various factors including sodium intake, high sodium levels, decreased levels of potassium, angiotensin II, increased ureaplasma, post dialysis hypovolemia and psychological factors. Thirst occurs due to an increase in extracellular fluid osmolality, then the kidneys release renin which results in the production of angiotensin II which stimulates the hypothalamus then produces thirst (Suarniati, 2019). If thirst cannot be restrained, excess fluid consumption can cause an increase in interdialytic weight gain.

The results of statistical tests in this study showed that there was a significant relationship between stress and IDWG (r=0.562, p-value=0.000). The magnitude of the stress determinant coefficient is 31.6%, meaning that stress determines 31.6% IDWG, the remaining 68.4% is determined by other factors. This result is in line with the research of Khairidina et al. (2020) there is a significant relationship between stress and IDWG with a p value of 0.000 (p-value <0.05). The psychological impact of CRF sufferers undergoing hemodialysis can be manifested in a series of behavioral changes including becoming passive, dependent, feeling insecure, confused and suffering (Sulistyaningsih, 2017). Respondents experience a loss of freedom, hope for longevity and sexual function so that it can cause anger which eventually results in a state of depression (Rahmawati, 2008). Stress can affect the balance of fluids and electrolytes in the body. Stress increases aldosterone and glucocorticoid levels, causing sodium and salt retention. The stress response can increase fluid volume resulting in decreased cardiac output, blood pressure, and tissue perfusion. The effects of stress experienced will lead to a decrease in patient adherence to the therapy being undertaken. Such as limiting fluids and nutrients consumed by patients while undergoing hemodialysis (Khairidina et al., 2020). This is corroborated by the research of Angraini & Putri (2016) which shows that stress on hemodialysis clients can cause clients to stop monitoring fluid intake, some even stop doing hemodialysis therapy, therefore it can cause Interdialytic Weight Gain.

The results of statistical analysis showed that there was no significant relationship between gender and IDWG (p-value = 0.473, $\alpha = 0.05$). These results are in line with Mustikasari & Noorratri's research (2017) that there is no significant effect between gender with IDWG p-value = 0.60. This is corroborated by research by Natashia et al. (2019) found that there was no significant relationship between species and IDWG with

a value of r = 0.17, p-value = 0.243. This is also in line with the research of Siagian et al. (2021) that there was no significant relationship between gender and adherence to fluid intake restrictions in hemodialysis patients, resulting in an increase in IDWG p-value = 0.312. Interdialytic weight gain (IDWG) is related to patient compliance behavior in undergoing hemodialysis and what is consumed. Problem solving abilities, analytical skills, competitive drive, motivation, sociability and learning abilities are the same between males and females (Siagian et al., 2021). Both men and women have the same risk factors for an increase in IDWG, this is influenced by patient compliance (Istanti, 2011).

Statistical test results showed no significant relationship between education and IDWG (p-value = 0.651, α = 0.05). This result is in line with Mustikasari & Noorratri's research (2017) that there is no significant effect between education level and IDWG p-value = 0.47. It is not different from the research results of Wahyuni & Indarti (2019) that there is no significant relationship between education level and IDWG p-value = 0.565. Corroborated by research by Natashia et al. (2019) found that there was no significant relationship between education and IDWG with a value of r = 0.39 p-value = 0.167. This is in line with research by Istanti (2011) that there is no significant difference between educational level and IDWG (p-value=0.753, □=0.05). This shows that the ability to carry out independent care during the two hemodialysis periods, especially the management of IDWG, is not only influenced by education level. It is likely that it is influenced by the results of interactions between knowledge, attitudes and patient actions in carrying out the diet obtained through own or other people's experiences, or other sources of information such as the media (Mustikasari & Noorratri, 2017).

There were several limitations in this study such as the insufficient number of samples due to the large number of hemodialysis patients who were exposed to Covid-19 so they were isolated, monitoring fluid intake and output could not be done alone, there was a need for collaboration between families and respondents because respondents were at risk of forgetting.

## CONCLUSION

In this study, the factors associated with IDWG were fluid intake, thirst and stress. Excessive fluid intake significantly increases the respondent's IDWG due to decreased kidney function. High thirst significantly increases the respondent's IDWG, because thirst triggers the desire to increase fluid intake. Stress can significantly increase the respondent's IDWG. Stress will cause a decrease in patient compliance in all respects, including controlling fluids and undergoing hemodialysis. Factors that are not related to IDWG are age, gender and education.

Future research is expected to explore more deeply the factors of fluid intake, thirst and stress in increasing IDWG by examining more deeply what the patient feels, what triggers these factors and how the impact is felt if there is an increase in IDWG, as well as providing interventions to regulate increased fluid intake, thirst and stress to prevent excess body weight.

**ACKNOWLEDGMENTS**:
No funding.

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