



## Adherence to Fluid Restrictions among Haemodialysis Patients in Private Haemodialysis Centres in Kuala Lumpur Malaysia

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### ABSTRACT

End stage kidney disease (ESKD) is an irreversible progressive kidney function that requires kidney replacement therapy. Over two million people have currently received dialysis treatment worldwide. Haemodialysis treatment has been developed as a practical, safe and efficient method for the care of patients with ESRD. However, HD treatments generally have a more negative impact on patients' quality of life (QoL), high morbidity and mortality rate, as well as major adverse cardiovascular events. Compliance to dietary, fluid restrictions, medications and treatment regimens is one of the contributors to the quality of life observed in patients ESKD undergoing haemodialysis treatment. This study is aimed on the measurement of the fluid restriction adherence of 132 haemodialysis patient in MAIWP-PICOMS haemodialysis centres. An interdialytic weight gain (IDWG) was used as an indicator to describe the level of adherence level. Method: An observational study was conducted among consenting patients on HD for  $\geq 3$  months with criteria of age from 18 to 65 years old using end-stage renal disease-adherence questionnaire (ESRD-AQ). Result: Of 132 participated patients were observed, 53% were female and 47% were male with a mean age of  $49.05 \pm 11.52$  years and HD duration mean length of 1.33 ranging from 1-5 years. Statistically, a significant association between level of fluid adherence behaviour and treatment duration ( $p < .01$ ) was found in this study. Meanwhile, the level of adherence to fluid restrictions was range between 45.5% - 50%, which was considered good. Conclusion: Significantly, adhered to fluid restriction among haemodialysis patients may prevent patients from many adverse consequences and improve the quality of life. Therefore, nurses and healthcare providers has been suggested to play a pivotal role in delivering education on fluid restriction for haemodialysis patient.

## 1. Introduction

Chronic kidney disease (CKD) is a global public health problem that is increasing throughout the year [1]. Approximately, 850 million people worldwide are affected by CKD and over 2.4 million deaths related to the disease are reported each year [2]. End stage kidney disease (ESKD) is an

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irreversible and progressive kidney dysfunction that can eventually develop negative impacts on a patient's life and place a financial burden on the patients, their families and the government [3-6]. A person with ESKD requires a kidney replacement therapy (KRT) to replace the kidney function such as haemodialysis (HD), peritoneal dialysis (PD) or kidney transplant [7].

### *1.1 Research Background*

By the end of year 2021, National Kidney Foundation reported that, over 2 million people have currently received dialysis treatment worldwide. Locally, the incidence of patients on kidney replacement therapy (KRT) continues to rise from 7000 new dialysis cases to 9592 in 2022. Thus, the number of prevalent patients on KRT has also increased to 53,164 in 2022. Of these patients on KRT, there were 45,045 undergoing haemodialysis treatment [8]. Haemodialysis treatment has been developed as a practical, safe and efficient method for the care of patients with ESKD [9]. However, HD treatments generally have a more negative impact on patients' quality of life (QoL), high morbidity and mortality rate, as well as major adverse cardiovascular events, which are related to either short-term or long-term complications of the treatment and kidney failure itself [5]. According to reports [10], the annual crude death rate among haemodialysis patients in Malaysia was 17.8% in year 2021 due to severe cardiovascular disease. Cardiovascular disease has consistently been reported as the primary cause of mortality in HD patients throughout the years including deaths occurring at home [10].

Patients who are undergoing HD treatment are at risk of cardiovascular diseases, poor quality of life and eventually, the highest mortality rate resulting from the accumulation of excessive fluids. Therefore, HD patients are highly recommended to adhere to restriction on fluid and water intake and following the recommended diet by the medical professional [11]. Even though haemodialysis can remove the accumulation of fluids from the body, haemodialysis alone without patients' commitment and adherence to fluid control intake may lead to fluid overload, hypertension and severe adverse cardiovascular events [12,13].

### *1.2 Literature Review*

Managing the fluid and diet requirements in ESKD patients undergoing haemodialysis is complex and challenging [14]. Meanwhile, dietary and fluid restrictions are confusing and serve as a major burden for patients with ESKD, especially those undergoing haemodialysis [15]. According to Hong *et al.*, [16] haemodialysis patients described fluid management as a constant struggle despite the outcome. Many patients have difficulty managing their nutrition and fluid intake, which is related to psychological processes, patient behaviour and patient perceptions [17]. Thus, the preoccupation with fluid restrictions and dietary recommendations often embarks in haemodialysis patients [18].

#### *1.2.1 Adherence behaviour to fluid restrictions*

End-stage kidney disease patients not only receive complicated haemodialysis management but must also adhere to a variety of dietary and fluid restrictions and lifestyle changes that affect their social and psychological well-being [5, 19]. HD patients are required to adhere to the sub-areas of food and fluid intake. Even though regularly haemodialysis treatment can eliminate significant amounts of fluid and waste products, adherence to diet and fluid intake remains crucial for their daily health [1]. Studies emphasised that adherence to these two recommended measures has a positive impact on the patient's quality of life [5,12,20,21], reducing adverse cardiac events [22 – 23] and

indirectly reducing the morbidity and mortality rate among ESKD patients undergoing haemodialysis therapy [24]. According to Halle *et al.*, [25] intolerable to dietary and fluid restrictions among HD patients have been positively associated with increased prevalence of cardiovascular events and increased either short-term or long-term complications associated with dialysis. Hong *et al.*, [16] stated that adherence to dietary and fluid restrictions is the most challenging aspect and has been discussed widely regardless of geographical or cultural borders. In his study on dietary and fluid restrictions perceptions, the authors suggested that dialysis nurses, physicians, dietitians and nephrologists continuously provide education to renal patients to improve their knowledge and change the patient perceptions of fluid and dietary management to improve quality of life and clinical outcomes.

### 1.2.2 Consequences of non-adherence to dietary and fluid restrictions

When kidney function declines, fluid accumulate in the blood and body tissues [26]. The accumulation of fluids gives problems in the patients such as hypertension [13], related to fluid overloads [27], increased interdialytic weight gain, and eventually adverse cardiovascular events [23]. These effects are significant predictors of all-cause mortality, which indicate a potentially concerning outcome for cardiovascular mortality in haemodialysis patients, increasing cost and burden to the healthcare system related to higher hospitalisation and management [5, 22]. Practically, patients with end-stage kidney disease must restrict fluid intake to 500-700 ml daily to prevent fluid accumulation in the body. Fluid overload is a common clinical problem among ESKD patients [15]. In normal people, excessive fluid will be removed from the body by the increase in urinary excretion [28]. However, in ESKD patients, the glomerular filtration rate (GFR) decreases to less than 15 ml per minute. Reduced GFR causes the fluid to be retained in the body as fluid is overloaded.

In addition, patients may experience interdialytic weight gain (IDWG) as a result of hypervolemia or excessive hydration. In dialysis patients, hypertension and the onset of cardiovascular disease are strongly correlated with excessive hydration [29]. Studies shown that mortality rate of 9.1 per 100 people-years, 87 deaths and 54% cardiovascular deaths linked to excess fluids inclusively related to IDWG at 4% of dry weight (DW) was an independent predictor of all-cause death and it was shown that patients on traditional HD had a questionable outcome for cardiovascular mortality. A subgroup of patients with a worse prognosis was indicated by the prevalence of high IDWG in the context of malnutrition, which represented a considerable increase in the probability of death. An improving understanding of the interdialytic weight gain guideline among haemodialysis patients may decrease the complications related to fluid overload.

In the current setting of the study, the researcher found that, approximately, 70% of HD patients had an average weight gain 2.5 – 5 kilograms (IDWG > 5% of dry weight) within a dialysis interval of one day and a dialysis schedule of three times per week. Incident of hypotension or angina occurred during treatment due to the large interdialytic weight gain and excessive fluid removal during haemodialysis has been often reported and observed. Thus, patients have been reported with high incidence of hospitalization related to fluid overloaded occurred among patients receiving haemodialysis treatment in MAIWP-PICOMS haemodialysis centres.

Significantly, this research provides the level of adherence behaviour to fluid restrictions on ESKD patients undergoing haemodialysis treatment, which is beneficial to patients, the nursing practice and organisations namely HD centres and the government. Through this research, the patients will further realise their adherence behaviour towards fluid restrictions, which can be significant for them to stay healthy and promote quality of life. Moreover, the findings presented in this study will convey valuable information for future research to explore the factors related, as well as the impacts on the

patient, nursing practice and the government. Thus, such intervention planning and education can be provided to promote the patient's compliance and empower the dialysis nurses and dialysis providers on the importance to deliver effective health education to give a positive impact on patients, nursing organisations and the government.

The objective of this study is aims on measuring the level of adherence behaviour on fluid restrictions in ESRD patients undergoing haemodialysis treatment in three selected private haemodialysis centres in Kuala Lumpur. The other objectives of this study are to assess the relationship of the adherence behaviour to fluid restriction with demographic variables.

## **2. Methodology**

### *2.1 Study Design and Sampling*

An observational study was conducted on 132 haemodialysis patients from July to September 2021 in three private haemodialysis centres in Kuala Lumpur. The sampling size was determined by the Raosoft calculator based on a total population of 200 patients with interval confidence of 95%. The inclusion criteria for participated as following: i) haemodialysis patients who have finished their three-month maintenance course of treatment; ii) regularly undergoing haemodialysis three times a week for at least three months or longer; iii) be at least 18 years old; v) speaking and understanding Malay or English. Patients who were unwilling to participate, Alzheimer's disease and/or other communication disorders were excluded from this study.

### *2.2 Instrument*

The self-administered end-stage renal disease adherence questionnaire (ESRD-AQ), which is based on a multiple-choice indicator related to adherence to fluid and diet was adapted from the previous study [30]. The questionnaires were modified and created to assess for fluid limitations. Measurement levels were classified as poor, fair and good adherents.

### *2.3 Ethical Considerations*

The study was reviewed and approved from the Research Management Committee of the University College MAIWP International.

## **3. Results**

### *3.1 Demographic Characteristics of the Patients*

Table 1 displays the patients' demographic characteristics and information on the HD duration. The total number of patients who participated in the study was 132 patients (n=132). Of 132 participants, 47% were men, 53% were women aged between 18 to 65 years, with a mean of 3.22 (SD, 0.975) ranging from 41-65 years old. Majority of patients were married with a total number of 92 (69.7%). Majority of the participants in this study were Muslim (96.2%, n=127) followed by Buddha (2.3%, n=3) and the minority were Hindu (1.5%, n=2). Based on the geographical and socio-economic status of the populations in the study area, the majority of the patients who undergo HD treatment in these centres were bottom 40 (B40) population with an income of below RM 3500 (90.9%; n= 120). Of the total participants, 69.7% (n=92) patients graduated only from secondary school educations. Due to the study inclusion age criterion between 18-65 years old, only 14.4% (n=19) of patients were retired, while the others were employed (40.9%; n= 54), 37 (28%) housewives, 21 (15.9%)

unemployed, and only 1 (0.8%) is pursuing study in college. Regarding the haemodialysis information of the patients in this study, the mean duration of the dialysis treatment was 1.33 (SD, 0.59 at a range of 1-5 years). There were 72.7% (n=96) patients on HD treatment below five years, 21.2% (n=28) within 6 to 10 years and 6.1% (n=8) greater than 10 years.

**Table**  
Demographic characteristics of the patients

| Variables                     | Frequency | Per cent | Mean (SD)    |
|-------------------------------|-----------|----------|--------------|
| Age, years                    |           |          |              |
| 18-30                         | 12        | 9.1      | 3.22 (0.975) |
| 31-40                         | 15        | 11.4     |              |
| 41-50                         | 37        | 28       |              |
| 51-65                         | 68        | 51.5     |              |
| Gender                        |           |          |              |
| Male                          | 62        | 47       | 1.53 (0.501) |
| Female                        | 70        | 53       |              |
| Religion                      |           |          |              |
| Muslim                        | 127       | 96.2     | 1.05 (0.285) |
| Buddha                        | 3         | 2.3      |              |
| Hindu                         | 2         | 1.5      |              |
| Marital status                |           |          |              |
| Single                        | 25        | 18.9     | 1.92 (0.547) |
| Married                       | 92        | 69.7     |              |
| Divorced/Separated            | 15        | 11.4     |              |
| Household income, RM          |           |          |              |
| <3500                         | 120       | 90.9     | 1.10 (0.324) |
| 3501-7000                     | 11        | 8.3      |              |
| >7001                         | 1         | 0.8      |              |
| Educational level             |           |          |              |
| Primary school                | 16        | 12.1     | 2.08 (0.588) |
| Secondary school              | 92        | 69.7     |              |
| College /University           | 22        | 16.7     |              |
| Others                        | 2         | 1.5      |              |
| Occupation                    |           |          |              |
| Employed                      | 54        | 40.9     | 2.32 (1.286) |
| Unemployed                    | 21        | 15.9     |              |
| Retired                       | 19        | 14.4     |              |
| Housewife                     | 37        | 28       |              |
| Students                      | 1         | 0.8      |              |
| Length of HD treatment, years |           |          |              |
| 1 – 5                         | 96        | 72.7     | 1.33 (0.59)  |
| 6 – 10                        | 28        | 21.2     |              |
| >10                           | 8         | 6.1      |              |
| Comorbid factors              |           |          |              |
| Diabetes                      | 77        | 58.3     | 1.53 (0.693) |
| Hypertension                  | 40        | 30.3     |              |
| Others                        | 15        | 11.4     |              |

### 3.2 Level of Adherence to Fluid and Restrictions

The main objective of this study is to measure the level of adherence to the fluid restrictions among ESRD patients undergoing haemodialysis treatment. IDWG was used as an indicator for fluid adherence in this study with the results between two consecutive dialysis sessions were described as  $\leq 1$  kg/day (good), 1–2 kg/day (fair) and  $> 2$  kg/day as poor adherence. Figure 2 illustrates the level

of adherence to fluid restrictions. Patients' IDWG was ranged between 0.2 and 5.2 kg with a mean of 1.56 kg (SD, 0.609) between two consecutive dialysis sessions. Of 132 participants, 50% (n=66) patients were good, 43.9% (n=58) were fair and 6.1% (n=8) of patients were poor regarding adherence to fluid restrictions.

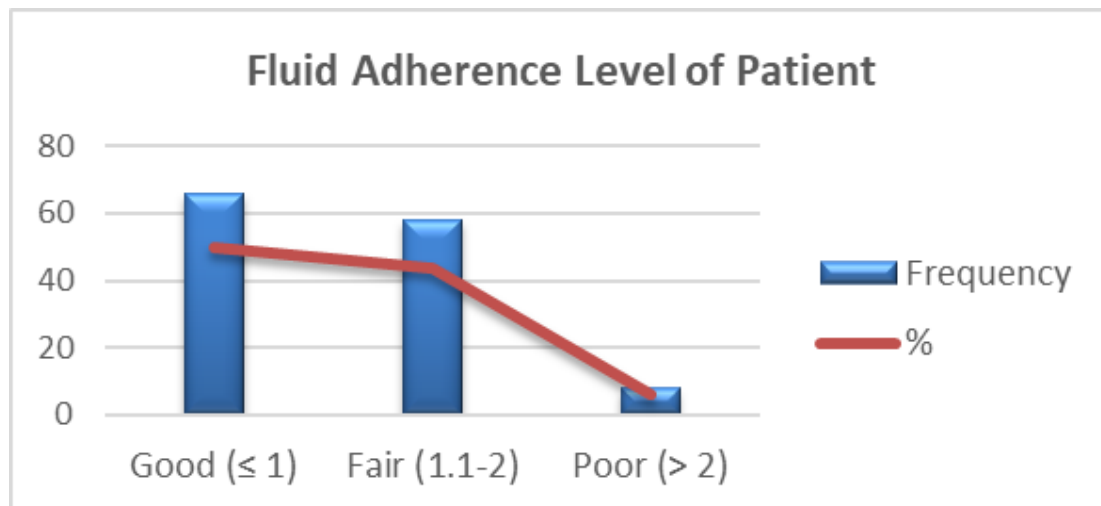


Fig. 1. Level of adherence to fluid restrictions

### 3.3 Adherence Behaviour to Fluid Restrictions by Demographic Characteristics

Table 2 describes the fluid restrictions adherence level shown by the demographic characteristics of the patients in the study. The demographic characteristics includes age, gender, education level, occupation, duration of the haemodialysis treatment and comorbid disease. The findings showed that the total number of patients who adhered to fluid restrictions was good at 51 (39%), fair at 79 (60%) and poor at 2 (2%).

The patients in the age group of 51-65 years old showed good adherence to the fluid restrictions. There were 22% (n=29) of patients in this group who have good adherence to fluid intake. However, this group (51 to 65-year-old) was also found to mostly contributed to fair adherence to fluid restrictions (29%, n=38). Furthermore, it was discovered that only 4% (n=5) of patients in the age group of 31-40 years old demonstrated good adherence to fluid restrictions. The huge gap between these groups may be because the group of 51-65 years old is the one receiving a bigger HD treatment in the centres under study. Females' contribution was higher in the good adherence to fluid intake compared to males. The table shows that 29 (22%) women patients showed good adherence and 41 (31%) were fair to fluid restrictions. In this study, it was revealed that 22 (17%) of male patients showed good adherence, 38 (29%) were fair and 2% displayed poor adherence to fluid restrictions.

Of 92 participants who graduated from secondary school, 42 (32%) of them were having good compliance with fluid restrictions and another 49 (37%) were fair. In this study, the highest group of patients receiving HD treatment were employed. Among them, 14% of employed patients had good adherence to fluid intake, while 27% were fair. Of 132 respondents, 96 patients have been receiving HD treatment below 5 years, 28 patients were 6 to 10 years and only 8 patients undergoing HD treatment greater than 10 years. The majority of the patients' duration between 1 to 5 years suggests that they are having moderate adherence to fluid intake (n=63, 48%). In this study, diabetes contributed to the highest group of comorbid factors. 23% of patients with diabetes had good adherence to fluid intake, 33% was fair and 2% was with poor adherence. For hypertension, 11% of patients were good and 19% were fair in terms of adherence to fluid intake.

**Table 2**  
 Level of adherence behaviour to fluid restrictions by demographic characteristics

| Variables                | Good |    | Fair |    | Poor |   | Total |     |
|--------------------------|------|----|------|----|------|---|-------|-----|
|                          | n    | %  | n    | %  | n    | % | n     | %   |
| Age, year                |      |    |      |    |      |   |       |     |
| 18-30                    | 7    | 5  | 5    | 4  | 0    | 0 | 12    | 9   |
| 31-40                    | 5    | 4  | 10   | 8  | 0    | 0 | 15    | 11  |
| 41-50                    | 10   | 8  | 26   | 20 | 1    | 1 | 37    | 28  |
| 51-65                    | 29   | 22 | 38   | 29 | 1    | 1 | 68    | 52  |
| Gender                   |      |    |      |    |      |   |       |     |
| Male                     | 22   | 17 | 38   | 29 | 2    | 2 | 62    | 47  |
| Female                   | 29   | 22 | 41   | 31 | 0    | 0 | 70    | 53  |
| Education Level          |      |    |      |    |      |   |       |     |
| Primary school           | 3    | 2  | 13   | 10 | 0    | 0 | 16    | 12  |
| Secondary school         | 42   | 32 | 49   | 37 | 1    | 1 | 92    | 70  |
| College/University       | 6    | 5  | 15   | 11 | 1    | 1 | 22    | 17  |
| Others                   | 0    | 0  | 2    | 2  | 0    | 0 | 2     | 2   |
| Occupation of Patient    |      |    |      |    |      |   |       |     |
| Employed                 | 19   | 14 | 35   | 27 | 0    | 0 | 54    | 41  |
| Unemployed               | 9    | 7  | 11   | 8  | 1    | 1 | 21    | 16  |
| Retired                  | 7    | 5  | 11   | 8  | 1    | 1 | 19    | 14  |
| Housewife                | 16   | 12 | 21   | 16 | 0    | 0 | 37    | 28  |
| Student                  | 0    | 0  | 1    | 1  | 0    | 0 | 1     | 1   |
| Treatment Duration, year |      |    |      |    |      |   |       |     |
| 1-5                      | 32   | 24 | 63   | 48 | 1    | 1 | 96    | 73  |
| 6-10                     | 18   | 14 | 9    | 7  | 1    | 1 | 28    | 21  |
| >10                      | 1    | 1  | 7    | 5  | 0    | 0 | 8     | 6   |
| Comorbid Disease         |      |    |      |    |      |   |       |     |
| Diabetes                 | 1    | 23 | 44   | 33 | 2    | 2 | 77    | 58  |
| Hypertension             | 15   | 11 | 25   | 19 | 0    | 0 | 40    | 30  |
| Others                   | 5    | 4  | 10   | 8  | 0    | 0 | 15    | 11  |
| Total                    | 51   | 39 | 79   | 60 | 2    | 2 | 132   | 100 |

### 3.3 Relationship between Fluid Adherence Behaviour with Demographic Variables

Table 3 displays the results of the Chi-Squared test on the association between fluid adherence behaviour and demographic variables (age, gender, education, occupation, duration of HD treatment and comorbid disease) of the haemodialysis patients in this study. The table revealed a significant association between fluid adherence behaviour and duration of HD treatment, with  $p < .05$ . The Chi-Squared test of association between fluid adherence behaviour and duration of HD treatment was  $(13.074 (4, 132) = 13.074, p = .01)$ . Hence, the null hypothesis of the association between fluid adherence behaviour and duration of HD treatment was not accepted.

However, there was no significant association between fluid adherence behaviour and other demographic variables found in this study, with  $p > .05$ . The results of the Chi-Squared test of association between fluid adherence behaviour and demographic variables showed that; age  $(5.272 (6, 132) = 9.743, p = .50)$ , gender  $(2.599 (2, 132) = 2.599, p = .27)$ , education  $(8.721 (6, 132) = 8.721, p = .19)$ , occupation  $(6.244 (8, 132) = 6.244, p = .62)$  and comorbid disease  $(1.861 (4, 132) = 1.861, p = .39)$ .

= .76). Thus, the null hypothesis of the association between fluid adherence behaviour and age, gender, education, occupation, comorbid disease of the patients was accepted.

**Table 3**

Association of fluid adherence behaviour and demographic variables

| Variables        | Pearson Chi-Square Value | df | p-value |
|------------------|--------------------------|----|---------|
| Age              | 5.272                    | 6  | 0.509   |
| Gender           | 2.599                    | 2  | 0.273   |
| Education        | 8.721                    | 6  | 0.190   |
| Occupation       | 6.244                    | 8  | 0.620   |
| Duration of HD   | 13.074                   | 4  | 0.011   |
| Comorbid disease | 1.861                    | 4  | 0.761   |

### 3.4. Discussion

This study was aimed of measurement on the level of adherence behaviour to fluid restrictions among 132 haemodialysis patients in MAIWP-PICOMS haemodialysis centres. The study objectives include assessing the association and relationship between adherence behaviour with variables among the patients undergoing haemodialysis treatment. The measurement of the adherence behaviour was done to identify the dietary and fluid compliance behaviour due to the high risk of cardiovascular morbidity and mortality among haemodialysis patients.

Since ESKD is irreversible and limiting resources in renal transplantation donation, raising ESKD patients opted for haemodialysis treatment becomes an issue in global health in terms of treatment and management [7]. Despite compliance to medication and dialysis schedule, patients undergoing haemodialysis require full compliance with dietary recommendations, fluids restrictions and comply to others regimen therapies to maintain quality of life and bring down the complications related to disease and treatment process. In this study, the level of adherence to fluid restrictions was indicated by IDWG as categorised into good, fair and poor.

#### 3.4.1 Adherence to fluid restrictions

Fluid restriction is most difficult to manage [16,17]. Numerous studies identified ESKD patients undergoing haemodialysis treatment as having poor adherence to fluid control [31-35]. The researchers concluded in overall, haemodialysis patients reported difficulty in following fluid restrictions with one-third of them being noncompliant to fluid and salt restrictions [35]. However, the result of this study revealed that the level of adherence to fluid restrictions was fair at a range of 43.9 - 50%. Whereas 43.9% of participants with increased IDWG were in the range of 1.2-2 kg per day (IDWG < 4% of dry weight) and 50% of participants with IDWG of <1 kg per day (IDWG < 3% of dry weight). The results of this study were similar to those of previous studies, which revealed that the level of adherence to fluid restrictions was ranged from 25.5 - 52% of good and 9.7 – 49.5% of poor adherents [1, 29, 34, 36, 37]. It can be emphasised that haemodialysis patients can be considered to have good adherence to fluid restrictions if the IDWG is between 3 - 4% of dry weight [38]. However, Bossola *et al.*, [14] suggested that the IDWG should be lower than 4 - 4.5% of dry weight according to the patients' body size.

Unfortunately, this study also revealed that, another 50% of patient on haemodialysis were not adhered to fluid limitations. Whereas, the patients were show interdialytic weight gain (IDWG) increased between dialysis day were bigger than 2kg. In several studies, many HD patients have



IDWGs that are higher than the suggested amount, while some have IDWGs of 10–20% [14-15]. Higher IDWG is linked to greater morbidity, such as ventricular hypertrophy and serious adverse cardiac and vascular events, as well as a higher risk of all-cause cardiovascular death [22]. Hence, it results in additional dialysis sessions that lower quality of life and raise expenses. The non-adherence to the fluid restrictions it seems because of the sociodemographic factors such as age, gender and educational level. Moreover, the treatment duration also plays a pivotal role in managing the fluid intake among haemodialysis patients.

### 3.4.2 Related factors to adherence behaviour

The statistical analysis revealed that, the adherence level to fluid restrictions was significantly correlated with the length of HD treatment ( $p < .01$ ). In contrast, previous studies found that treatment duration was not significantly impacted by fluid restrictions adherence behaviour to fluid restriction among patients undergoing haemodialysis [36, 38]. However, in the experience of the researcher, the duration of dialysis may affect the patients' adherent behaviour to dietary and fluid restrictions. According to Yanis *et al.*, [29], dialysis patients who are receiving HD treatment for greater than five years are more obedient to dietary and fluid restrictions. This is related to the residual renal function. The longer the ESRD patients are on haemodialysis treatment, the less urine will be produced by the patients. While the urine output is getting lesser, patients are required to adhere to the fluid intake as well. To prevent complications, patients usually will abide by the regimen of the treatment given to them.

This study also found that, there were no significant association between fluid adherence behaviour with age, gender, level of education, occupation and comorbid diseases ( $p > .05$ ). The study finding was confirmed by the studies conducted by Kartini *et al.*, [11], which found no correlation between adherence to fluid restriction and sex, age, or occupation. Although the results showed that females tend to be 1.4 times less adherent than males, there is no relationship between gender and adherence. According to the results of the previous studies, men did not adhere to fluid restrictions, while female patients were more compliant than male patients, according to another research [37]. This leads to the conclusion that previous research has failed to discover demographic characteristics that are consistently associated with behaviour related to fluid adherence behaviour [38].

The above literature demonstrates in the current study of self-measured knowledge and behaviour questionnaires; 57.6% ( $n=76$ ) of the patients are aware that limiting their fluid intake will keep their bodies healthy. Meanwhile, 55.3% of patients said they have no difficulty in controlling their water intake, while 16.7% assumed they followed the recommendation. However, on the type of difficulty questionnaire, 42.4% of patients were unable to control fluids intake. Several studies suggested that increasing a patient's knowledge and comprehension can affect their behaviour. Nurses, in addition to nephrologists, play a significant part in motivating patients to follow their treatment plans. According to research, nurses should encourage patients to develop self-management skills and give them holistic care as opposed to only technical care [9, 18, 38]. Patient-centred training programmes should be created to maintain the continuity of the training and that the knowledge levels of patients having regular haemodialysis therapy should be reviewed regularly.

### 3.5 Recommendations

Since kidney disease is more common in the Malaysian population, further study is needed to find ways to maintain and improve kidney health. The procedure by which healthcare professionals, especially renal nurses, constantly give patients important information and document their

understanding has to be more formalised. Patients should be given copies of the material after going over it with them and getting them to sign a form acknowledging that they have received and understood it. Adherence to dietary and fluid restrictions is crucial for individuals receiving haemodialysis treatment. Since the growing rates of haemodialysis problems are related to non-adherence to HD treatment regimens, patient survival, as well as rising morbidity and mortality rates, adherence is a major concern in ESKD patients. Interventional studies with a focus on the components of adherence that Malaysians find most difficult are required. Therefore, before giving dietary education, nurses should evaluate the patients' knowledge and behavioural level besides tailoring the teaching accordingly.

From the perspective of the researcher as a dialysis nurse and dialysis educator, this information can be used for further studies in investigating the factors and consequences of the non-adherent to dietary and fluid restrictions among ESKD patients. The findings of this study reflect that dietary and fluid non-adherent is an extremely complex issue among haemodialysis patients. Patients with ESKD receiving haemodialysis care must comprehend the nature of the disease, the significance of adhering to the recommended course of treatment, the advice on dietary intake and the necessity of adhering to fluid restrictions. As a result, the nurses and other healthcare professionals must play a crucial part in encouraging patients to adhere to their treatment regimens.

### *3.6 Limitations of Study*

The study's limitation is only focused on measuring the adherence level to fluids among haemodialysis patients in the three selected dialysis centres only. The sample size was small (n=132) since not all the patients in the selected HD centres participated in the study according to the sampling criteria. This means that the result may not represent a wider population of haemodialysis patients in the city or even the state. The findings of this study have presented and discussed advanced scientific knowledge by bridging gaps in the relationship between health-related quality of life (HRQoL) and complications of kidney disease, intercurrents during and after haemodialysis, adherence to dietary and fluid restrictions in patients with ESKD, as well as by highlighted potentially modifiable factors that lower HRQoL and can be recognised by experts.

## **4. Conclusion**

Despite adherence to haemodialysis schedules and compliance to prescribed medications, adherence to fluid restrictions play a pivotal role in enhancing the survival of patients with ESKD undergoing haemodialysis treatment. This study aimed to measure the level of adherence to fluid restrictions among haemodialysis patients, determine the association of adherence behaviour between demographic information and describe the relationship between adherence behaviour with the level of adherence to fluid.

The result showed that patients in the study were fairly adhered to fluid restrictions. The Pearson Chi-square test revealed a significant association between fluid adherence behaviour and treatment duration ( $p < .01$ ). The Pearson correlation test also demonstrated a strong relationship between IDWG with fluid adherence behaviour ( $r = 0.230, p = .01$ ;  $r = 0.26, p = .00$ ). In haemodialysis patients, disregarding dietary and fluid limits is a major cause for concern affecting patient outcomes including health related quality of life and survival. Ways to measure nonadherence due to ESKD need to be better understood. Improvements in patient education and an adjustment in patient attitudes about the fluid and water intake in people undergoing HD may enhance adherence and other results. Self-

efficacy and the idea of control seem to be significant indicators of whether or not someone would follow fluid limitations.

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