CHAPTER 5 DISCUSSION

5.0 Introduction

The discussion starts with a description of sample characteristics and patient knowledge which includes the source of information and an analysis of the questionnaire. Also included is a comparison of the mean total knowledge scores pre- and post-intervention, the mean total knowledge scores by demographic and clinical factors, the effectiveness of the patient educational intervention on knowledge improvement, and the association of demographic and clinical factors with knowledge. This was followed by a discussion on fluid compliance levels between the experimental and control groups at pre-intervention, 1-month, 3-month, and 6-month post-intervention, as well as the trend for fluid compliance indicators, the effectiveness of the educational intervention on fluid compliance improvement and lastly, the demographic and knowledge factors associated with fluid compliance.

5.1 Sample characteristics

Two hundred and ninety one participants were recruited, giving a response rate of 90% which implies a minimum level of sampling bias and a high level of representativeness. The majority of the sample was participants from the middle age group, with secondary level education and married. More than half of the sample was unemployed. Hypertension and diabetes mellitus were the most common concurrent diseases, and the majority of the participants were undergoing antihypertensive therapy. The sample characteristics were found to be similar with patients from other studies conducted within Asia (Tsay, 2003; Pang *et al.* 2001), which implies that the sample of dialysis patients selected for this study is similar to the general group of dialysis patients. The sample characteristics were also represented the haemodialysis patients in Malaysia

who are receiving treatment at hospital based dialysis, as documented in a previous study on compliance behavior done locally (Chan et al.2012).Even though the number of patients in the experimental (n = 154) and control (n = 137) groups were slightly different, the Chi-square test showed no significant differences in demographic and clinical characteristics between the two groups. The homogeneity of both groups in their baseline characteristics enables a causal effect to be seen and thus allows the effectiveness of the interventions to be assessed.

5.2 Fluid overload experience and symptoms

The majority of the participants in the study sample had previous experience with fluid overload. Slightly more than half of the participants revealed that the most common symptom they experienced was difficulty in breathing. Similarly, other studies have reported a high prevalence of fluid overload as common in hemodialysis patients who receive dialysis sessions thrice weekly (Linberg, 2010) which implies that fluid overload among hemodialysis patients is common and warrants proper control measures. It has been suggested that patient education on fluid control is important. Positive reinforcement is also essential to encourage patients to regularly apply learned knowledge to improve their fluid compliance (Barnett, 2008).

5.3 Sources of information on fluid and salt control

The findings showed that almost all the participants (91.8%) who received prior information on fluid and salt control usually obtained this information from doctors and nurses. Bittenbinder (2008) reported that the majority of patients believed that their healthcare providers gave them the best source of information about their illnesses and treatments, and that it was up to date and reliable. Although the majority of participants reported previously receiving information, most still lacked as indicated by

the low mean total knowledge scores obtained at the pre-intervention phase. The inadequate knowledge at the pre-intervention phase despite having received information was probably due to the non-availability of structured teaching programs for patients, as patients only received teaching or advice when problems occurred. This was supported by findings that showed that more than 70% of participants reported that they only received information when there was a problem. Furthermore, the information provided was only in verbal form and there were no written materials to strengthen their memory retention. All these factors could have possibly contributed to the low mean total knowledge scores during the pre-intervention stage.

It is recommended that in order to increase knowledge and compliance, the teaching process should involve repetition of the information taught, preferably presented in an audio-visual manner. It is best to offer positive reinforcements from the healthcare provider following this (Charold & Lancaster, 1995). Concerning the ability to retain information being taught, past studies have shown that approximately two-thirds of the teachings provided by the healthcare providers were forgotten almost immediately (Kessel, 2003). Only half of the information taught was retained, and most of the time, it was either recalled wrong, or forgotten over a period of time. All this evidence supports the idea on the need for continued teaching for all hemodialysis patients to improve their understanding of treatment and to increase their level of knowledge, as well as to retain information (Sathvik, 2007).

5.4 Analysis of questionnaire

As a result of the education intervention, findings showed that there was an increase in knowledge for both the experimental and control groups but it was higher in the experimental group. Based on these findings, it can be concluded that educational intervention does increase knowledge. Almost all aspects of patient knowledge increased after the educational intervention. The three highest increase in knowledge were tips on fluid control (OR 28.53), daily salt intake (OR 4.27) and awareness on the danger of fluid overload (OR 2.29). The results show a low increment (odds ratio ranging from 1.22 to 1.84) of correct responses between the experimental and the control group on knowledge aspects on food containing water, the importance of fluid restriction, the amount of fluid intake and weight control. This implies that more attention should be given to conveying information on fluid restriction and weight control in order to overcome the lack of knowledge in patients. The findings also imply that the teaching content should be reinforced and repeated to patients periodically in order to improve and retain their knowledge, as also suggested by Kutner (2001).

5.5 Knowledge on fluid and salt control

5.5.1 Knowledge level pre- and post-intervention

The results demonstrated that mean total knowledge scores were lower (5.80±1.31) during the pre-intervention but increased significantly (6.48±0.86) at post-intervention in the experimental group while in the control group, mean total knowledge scores remained low at pre- and post-intervention (5.56±1.14 and 5.70±1.08 respectively). The proportion of patients with improvement in knowledge levels was higher in the experimental group post-intervention and congruent with results from previous studies (Sathvik, 2007). Sathvik (2007) suggested that patient education was indeed beneficial

and able to increase patient knowledge, which may also have resulted in an improvement in treatment adherence. The educational intervention was developed based on Bandura's social learning theory (1977), and it stresses the importance of observation learning, the modeling process, and integrates a *continuous interaction between behaviors, personal factors - including cognition*. The findings supported the social learning theory whereby patients learned by interacting (individual teaching), observing (Patient Information Booklet) and reinforcement (weekly follow up and repetition of the related information). The educational intervention based on Bandura's social theory increased knowledge and behavior change in relation to fluid compliance.

5.5.2 Association of knowledge levels with ever received information

The results show that 145 participants from the experimental group who received information on fluid and salt control pre-intervention were classified as the group with 'high knowledge levels' (62.8%). This percentage of 'good knowledge' increased from 62.8% to 82.8% at post-intervention. Knowledge levels were found to increase significantly from 33.3% to 88.9% at the post-intervention phase for a minority (5.8%) of the experimental group even though they had not received the information previously. The control group who had previously received information showed a small and non-significant increase of 54.1% with 'high knowledge level' at the pre-intervention phase to 60.7% at post-intervention. Participants from the control group who had not previously received information were also found to have increased knowledge (46.7% to 60%). From the findings, it can be said that educational intervention may serve to increase patient knowledge. Since the knowledge increment in the control group was not the result of the educational intervention, this may have occurred by chance. It is possible that the increment in knowledge levels resulted from information sourced by participants as a result of knowing that they were in a study.

5.6 Mean total knowledge scores pre- and post-intervention

5.6.1 Mean total knowledge by demographic and clinical characteristics

This study found that the following patient subgroups reported higher knowledge: female patients, those from the 40-50 age, married, tertiary educated, full time employed, and those on a longer duration of dialysis therapy as well as patients with more than two concurrent diseases, on antihypertensive therapy, and on one or more types of antihypertensive medication. The finding are consistent with a previous study conducted by Sathvik (2007) which found that patients who were female, of a higher education level, and with longer duration in dialysis therapy were associated with better knowledge, in contrast to patients older than 60 years who had less knowledge increment at post intervention.

With regard to clinical characteristics, our results showed that having more than two types of concurrent diseases led to the highest mean total knowledge scores. The finding however is congruent with a study conducted by Burge *et al. (*2005), where patients with better subjective health status reported higher knowledge and adherence. In this study, almost all participants with two or more comorbid diseases were considered to be in good health because they were stable and receiving optimal care in addition to haemodialysis, and were not actively managing complications from their diseases. Patients with good health are able to learn better, as shown by the highest mean total knowledge scores in patients with good health status.

The results show that participants who were prescribed with more than one antihypertensive therapy showed the highest knowledge scores post-intervention. Similar results have been reported by Burge *et* al. (2005) who discovered that patients with more prescribed medications were more knowledgeable and had a higher adherence level. The possible explanation as to why participants with a higher number of medications also had a higher level of knowledge may be that when a patient has more health concerns, they become more responsible for their health and take more initiative to learn; their level of knowledge subsequently increases.

In this study, significant increases in knowledge scores were found post-intervention for all demographic and clinical characteristics. Significant differences in mean total knowledge scores between the experimental and control groups at pre- and post-intervention in almost all demographic and clinical characteristics may also provide evidence that the educational intervention was indeed beneficial and successfully increased knowledge on fluid and salt control in patients of various demographic backgrounds.

5.7 Effectiveness of patient education on knowledge improvement post-intervention

From the study, it was noted that the overall mean total knowledge score was low and there was no significant difference in the pre-intervention stage for the experimental and control groups. However, the mean total knowledge score post- intervention showed a significant increase in the experimental group. The findings were similar to a previous study which documented that educational intervention significantly improved the knowledge of not only dialysis patients but those with diabetes mellitus patients in medication and dietary adherence (Van Camp *et al.* 2011; Karakurt & Kasıkçı, 2011).

Based on the findings, teaching intervention brings about a high magnitude of knowledge improvement which can be seen through this study, which showed that the teaching intervention resulted in scores nearly 4 times higher for knowledge improvement in the experimental rather than the control group post-intervention. According to Julius *et al.* (2009) in an article review on medication adherence, it was documented that the development of interventional / educational strategies to improve knowledge and adherence was necessary. It was also suggested that the most effective strategy to improve knowledge and compliance should include giving individual education sessions and the use of written materials. Educational intervention used in the study which included the individual education sessions, the patient information booklet and reinforcement of the teaching content for 3 months showed a positive effect on knowledge improvement on the mean total knowledge level on fluid and salt control.

5.8 Factors associated with knowledge improvement on fluid and salt control post-intervention for the experimental group

The current findings from the univariate analyses showed that despite receiving the educational intervention on fluid and salt control, participants did not show much knowledge improvement and still experienced fluid overload. These participants were mostly males, between the ages of 40 to 50 years old, were on dialysis therapy for 5 to10 years, widowed, worked part time, and had more than 1 concurrent disease at the time of the study and were on more prescribed medications. However, there was an increase in the proportion of knowledge improvement in some of the factors studied. Specifically, the subgroups that showed a higher rate of knowledge improvement were participants who had no experience on fluid overload, and participants who had received advice previously. Those who received teaching in verbal and written form showed the highest percentage. Besides that patients of an older age (more than 60

years), who were on a shorter duration of dialysis therapy (<5 years), female, single, not educated, unemployed, with less than 2 concurrent diseases, and not on antihypertensive therapy also had high improvement rates in knowledge. It should be noted that not taking any antihypertensive medication significantly predicted knowledge improvement in this study.

Kimmel *et al.* (1998) suggested that the reason for the lack of knowledge improvement was probably due to the various reasons such as medical factors and psychosocial variables. These medical risk factors may include age, duration of dialysis, concurrent or comorbidity of disease and treatment, and fluid overload. The psychosocial variables were gender (male), marital status (widow), employment status (part time), and education level. These factors were found not only to have an effect on knowledge but also on compliance behavior in hemodialysis patients. This has also been supported by a study done by Baraz *et al.* (2009) on the effectiveness of an educational intervention on dietary and fluid compliance. It has been shown that working part time, having a low education level, being on a long duration of dialysis, and receiving the educational intervention orally did not result in better dietary and fluid compliance. Abbott (1998) suggested that effective patient education not only improves patient compliance and knowledge, but also patient and staff satisfaction. Educational interventions for dialysis patients should begin before they are started on dialysis, to educate them about the type of dialysis treatment options in order for them to choose from treatment options available. Additionally, nurses need to conduct patient assessments in order to evaluate their learning ability. Various factors should also be taken into consideration such as the conduciveness of the environment, good communication, encouragement and reinforcement, and involvement of family members. A successful patient education includes patient participation in their health-care decision making, improved

commitment to treatment, increased patient satisfaction and improved quality of life for both patients and their families (Van Camp *et al*. 2006).

Participants with high education levels but with low percentages of knowledge improvement may be attributed to the acceptance and adaptation to dialysis. As recommended by Goovaerts, Jadoul and Goffin (2005), the Pre-Dialysis Education Programme (PDEP) should be introduced to end stage kidney disease patients to provide them with information on renal replacement therapy and the treatment management, thus increasing their knowledge on dialysis treatment, self-care modalities, rehabilitation and improving quality of life. Further studies need to be carried out to identify factors that hinder the learning process in patient education among dialysis patients.

The multivariate analysis showed that the number of antihypertensive medications served as a significant predictor of knowledge improvement, and contrasts with a study by Burge *et al.* (2005) on the correlation of medication knowledge and adherence. Participants who did not take any antihypertensive medications had more than two times the amount of knowledge improvement compared to those taking more than one type of medication. This may be due to the lesser stress associated with the complexity of coping with numerous medications regimes. Lesser stress results in better learning ability and knowledge improvement. Therefore it is preferable that patients should be prescribed combination drug therapies, with less frequent consumption of medications and lesser number of medications in order to reduce the complexity of the medications regime.

5.9 Fluid compliance status during the pre- and post-intervention stage

The three indicators for fluid compliance used were interdialytic weight gain (IDWG), mean predialysis blood pressure (MPBP) and rate of fluid adherence (RFA). The results showed that there is a difference in compliance levels pre- and post-intervention for the IDWG and RFA, however there was no difference on the MPBP pre- and post-intervention.

5.9.1 Fluid compliance levels

5.9.1.1 Interdialytic weight gain (IDWG)

The mean IDWG during the pre-intervention stage was 2.34kg±0.73 for the experimental group, which showed that participants did not comply with the recommended fluid intake. However, the mean IDWG showed a significant reduction at 1 –month (1.98kg±0.54) and remained stable at 3-month (1.99kg±0.54), and 6-month (2.00kg±0.76) post-intervention. For the control group, the mean IDWG showed non-compliance (2.22kg±0.55) during the pre-intervention and continued with no improvement at 1-month (2.20kg±0.55), 3-month (2.24kg±0.65), and 6-month (2.20kg±0.76) post-intervention. There were significant differences in mean IDWG between the experimental and control group at pre- and post-intervention, specifically at 6-month post-intervention. The findings of this study were in line with the results from a previous study by Tsay (2003) on self-efficacy training to improve fluid intake compliance among haemodialysis patients. Tsay (2003) found that the mean weight gain in the experimental group decreased in the 1-month, 3-month and 6-month following the intervention. There was also a slight decrease in mean weight gain in the control group at the different intervals during post-intervention. Baraz *et al.* (2009)

found that the interdialytic weight gain decreased significantly after the educational intervention for end stage renal disease patients as well as in patients receiving maintenance haemodialysis treatment, which further strengthened our findings.

In this study, it is apparent that the educational intervention improved compliance on the IDWG. This study found that there was an almost two fold improvement on the IDWG between the baseline and at 6-month for the experimental group. The verbal instruction model based on Bandura's social learning theory was effective to improve knowledge. Although the change in knowledge was relatively small in magnitude but the compliance of IDWG improved substantially.

5.9.1.2 Mean predialysis blood pressure (MPBP)

There were no significant differences in MPBP between the experimental and control groups during the pre-intervention phase. The MPBP increased at 1-month and 3-month post-intervention but decreased at 6-month post-intervention for both the experimental and control groups. Dry weight and fluid retention may have contributed to the increment in blood pressure. It has been noted that hypertension is mainly caused by volume expansion and fluid retention (Chen *et al*.2003; Leunissen *et al.* 1999). A study conducted by Leypoldt *et al.* (2000) showed that there was a relationship between volume status and blood pressure. An observation made by Leypoldt *et al.* (2000) showed that one third of the patients in the experimental and control groups did not achieve the ideal dry weight during treatment with haemodialysis and that more than half of those patients were prescribed antihypertensive medication.

Weir (2010) commented that inadequate volume control and inability to maintain dry weight is an important factor that contributes to high blood pressure. In addition, volume-dependent hypertension is treated with vasodilators, which makes it more difficult for fluid to be removed and to achieve dry weight. It was suggested that

restriction on fluid and salt intake and sodium concentration reduction in dialysate may help with the control of volume overload and in establishing dry weight, thus giving better control of blood pressure (Weir, 2010; Lopez-Gomez, 2005). In this study, there was no significant improvement on MPBP compliance levels at 1-month, 3-month and 6-month post intervention. The various factors that contribute to high blood pressure in hemodialysis patients include poor self-care behaviors such as excessive salt and fluid intake resulting in excessive weight gain, the practice of routinely consuming BP medication prior to hemodialysis treatment, nonadherence to antihypertension medication regimens, missing haemodialysis treatments or shortening the duration of the haemodialysis treatments (Horl & Horl, 2002; Rahman *et al.* 1999).

Agarwal (2003) recommends maintaining the recommended dry weight and a low-sodium diet to improve the patient's blood pressure control in addition to antihypertensive therapy. In this study, the researcher did not look into dry weight factors and patient adherence to the antihypertensive medication, and this probably affected the findings of the study. This issue needs to be addressed promptly in order to control blood pressure and improve fluid compliance. Health care providers especially dialysis nurses should be aware of the contributing factors that influence the level of compliance, identify noncompliant behavior and assist patients so that they are able to achieve better fluid compliance (Kyngas *et al.,* 2000).

5.9.1.3 Rate of fluid adherence (RFA)

With regards to the rate of fluid adherence, more than 75% of the patients were categorized as compliant. The current findings show that the mean fluid adherence rate was less than 50% during the pre-intervention for both the experimental and control group. The results were congruent with a report by Vlaminck *et al*. (2001), where similarly 50% of the patients were found to be noncompliant with their fluid intake which was assessed using the dialysis diet and fluid nonadherence questionnaire. This was further supported by an international study using data from The Dialysis Outcomes and Practice Patterns study (DOPPS) by Saran *et al.* (2003), which reported that the highest excessive weight gain was observed among the noncompliant groups. Excessive weight gain indicated nonadherence to fluid intake and contributed to a low RFA. It was demonstrated through the findings of this study where the mean RFA in the experimental group significantly increased from the baseline (47.1%±25.92) to 1-month (68.5%±23.23) post-intervention, but reduced to 64.56%±25.33 at 3-month and 64.66%±24.86 at 6-month post-intervention. The results showed a significant difference within the experimental group from baseline to 6-month post intervention. There were no significant increase in the mean RFA for the control group and the compliance percentage remained low. There was a slight increment in mean RFA from 49.04%±24.93 to 50.75%±29.34 at 1-month but it dropped to 46.88%±26.65 at 3-month post-intervention, and increased to 48.91%±25.91 at 6-month post-intervention.

The control group showed no significant difference on the RFA from the baseline at 6-month post intervention. There were significant differences in the mean RFA compliance between the experimental and control group post- intervention. There was a nearly three- fold increase at 1-month, 3-month and 6-month post- intervention. It can

be concluded that the educational intervention given to patients in this study improved RFA compliance among hemodialysis patients (Kutner, 2001).

5.9.2 Trends of fluid compliance between experimental phases

The mean IDWG significantly decreased by 0.26 kg from baseline to the 1-month post intervention phase (2.24kg to 1.98kg), but increased slightly (0.01kg) at 3-month and at 6-month post-intervention phase. The results were similar to a study conducted by Tsay (2003) which found that IDWG dropped by 0.27kg at 1-month and 0.33kg at 3-month, and decreased 0.12kg at 6-month following the intervention. A mixed between-within subject ANOVA analysis showed that there was a significant difference in IDWG over the baseline, 1-, 3- and 6-month intervention for both the experimental and the control groups. The findings were supported by a past study (Tsay, 2003) where the group's main effect was significant between groups. The result supported the hypothesis that hemodialysis patients who received intervention had better fluid compliance than those who did not receive the intervention. Tsay (2003) concluded the self-efficacy training was reasonably successful, as the IDWG dropped following the intervention. Tsay (2003) suggested that replication and expansion of the study was needed to evaluate if the self-efficacy training was entirely responsible in improving fluid compliance. The reduction in IDWG was important because it indicated an improvement in compliance following the intervention. Even though the magnitude of the decrease was small in this study, it was clinically significant because fluid retention accumulates over a period of time before patients developed symptoms of fluid overload.

However, the MPBP trend did not show a reduction post-intervention in the experimental group. The mean MPBP increased at 1-month and 3-month, but decreased at 6-month; there was no significant difference in the pre-and post- intervention phase within the group. The MPBP of the control group showed an increment at 1-month and 3-month, and a slight decrease at 6- month. A mixed between-within subject ANOVA analysis showed no significant changes on the MPBP over the baseline, 1-, 3-, and 6-month intervention for the experimental and control groups. The results of this study are in line with the previous study by Barnett (2008), which reported no significant improvement in blood pressure after an education programme. Both this and the past study showed no improvement in MPBP following the educational intervention. This was probably because the majority of end stage kidney disease patients were hypertensive and more than half of the patients were on antihypertension medications. As mentioned earlier, one third of the haemodialysis patients did not achieve dry weight after dialysis because of high IDWG, and that contributed to overall poor control of blood pressure. As written by Morse (2003), hypertension in dialysis patients may be related to sodium and water retention and that if patients consumed less water and salt, weight gain would reduce as well. Lopez-Gomez *et al.* (2005) supported this through a previous study which showed a positive relationship between the IDWG and MPBP, with the IDWG directly correlated with the daily number of antihypertensive medication that patients took. Dialysis nurses should help patients to establish dry weight and reduce the prevalence of volume –dependent hypertension. Individual teaching sessions encourage patients to ask questions, and the nurse's support is critical to help provide supervision, information and reinforcement concerning the treatment regime for patients to increase compliance with fluid intake (Lindberg, 2010).

The RFA trend showed a high increment of about one and a half times greater than the baseline to 1-month but saw a decrease of about 4% at 3- and 6-month post intervention in the experimental group. Compared to the RFA in the control group, there was a 1% increase at 1- and 3-month, and a reduction at 6-month post intervention. A significant difference in the RFA between the experimental and the control group was observed in the results of the mixed between-within subject ANOVA. The results indicated that the educational intervention improved RFA compliance in the experimental group. However, the education should be a continuous and structured program, preferably on a monthly basis to strengthen knowledge and fluid compliance among haemodialysis patients.

5.10 Effectiveness of educational intervention on fluid compliance improvement

Various studies have assessed the benefits of educational programs which include a reduction in the incidence of emergency dialysis and improved patients health (Moss and Schwartz, 1999; Tsay, 2003; Barnett *et al.* 2008). A study by Nicolette *et al.* (2000) reported poor compliance rates despite the implementation of a patient education program, which implied that the patient education did not improve fluid compliance. Further studies are needed to determine the various forms of education intervention that may enhance fluid compliance.

The educational intervention proved to be very effective in improving compliance on the IDWG and RFA but ineffective for MPBP at 1-month, 3-month and 6-month post intervention. The participants of the experimental group showed a higher rate of compliance on the IDWG post-intervention. There was a nearly five-time proportion of compliance improvement at 1-month, and this increased ten-fold at 3-month but decreased by seven times at 6-month when compared to the control group.

The MPBP compliance improvement rate was low across three different intervals for the participants of the experimental group. This was probably due to poor volume control and difficulty in keeping to dry weight (Weir, 2010) as mentioned in the earlier section (5.9.1.2 MPBP). As there were no significant changes on the MPBP, the causes could have been multi-factorial. Firstly, blood pressure control in hemodialysis patients does not concern just fluid and salt intake although those are the two main factors. Secondly, patients will need to have a more significant reduction in weight over a longer period of time to achieve (or come close to) their dry weight before a change in blood pressure can be observed (Agarwal & Weir, 2010). Some patients may still remain hypertensive despite achieving the recommended dry weight. However, the trend showed lowered blood pressure where the MPBP reading was lower at 6-month (104.70mmHg) as compared to 3-month (105.34mmhg). Perhaps future longitudinal studies with longer study time can show the blood pressure changes with the achievement of dry weight.

A marked increase in compliance improvement was observed on the RFA for the experimental group. There was an increment nearly eight times the proportion of patients with improvement in compliance following the educational intervention at 1-month, and it increased to six times at 3-month and maintained at 6-month. The results were similar to previous findings in which patient education was found to be effective in improving compliance in various aspects of treatment among dialysis patients (Batson and Schwartz, 2000). Strategies which included individual teaching, supervision, and encouragement improved compliance among dialysis patients. Moss and Schwartz (1999) utilized a cognitive behavioral intervention to teach dialysis patients to recognize noncompliant behavior and the results showed that patients were able to recognize difficulty in physical activities and symptoms of high blood pressure

and fluid overload and correspondingly reduce fluid intake. Tsay (2003) developed a structured self-efficacy training program to educate patients on fluid compliance with findings that showed that the IDWG significantly decreased following the intervention. The structured self-efficacy training used an individualized structured teaching program which was given to patients over 12 sessions. Education focused on renal failure and haemodialysis treatment, complications, fluid restriction and stress management which were delivered to patients. The patients showed improvement in fluid adherence and reduced weight gain. This was further supported by Barnett *et al. (*2008), where an education program was designed to teach patients on fluid, salt and weight control, with results congruent with Tsay (2003). From the findings of these previous studies, it can be concluded that patient education does improve fluid compliance.

5.11 Factors associated with fluid compliance

5.11.1 Factors associated with interdialytic weight gain (IDWG) compliance improvement at 1-, 3- , and 6-month

It was also found that groups who continuously showed the highest IDWG compliance improvement at 1–month, 3-month and 6-month were of older age, female, patients with no formal education, longer dialysis duration, with no other concurrent disease, not on any antihypertensive therapy and medication, and those with low knowledge levels. Some of these factors concur with the study done by Chan *et al.* (2012) which showed that older age group patients and females showed a higher rate of fluid compliance. A possible reason for compliance among older patients was better adaptation to the dialysis lifestyle and greater ability to accommodate the treatment regime.

Younger patients (40-50 age) were found to have lower fluid compliance and this may contribute to cardiovascular complications. Measures need to be taken to reduce mortality and to promote quality of life as the majority of Malaysian patients fell into this group (NRR, 2011). The finding that female patients had better fluid compliance was also supported by another study (Vlaminck *et al.* 2001) which mentioned that it was probably due to women being more receptive to changes and willing to follow advice more closely compared to men. Patients who were on dialysis for a longer duration were found to be more compliant and this contrasted with the findings by Chan *et al.* (2012).

Chan *et al* (2012) reported that patients who have been on dialysis for a longer duration were more likely to be noncompliant because they are frustrated and bored of the complicated treatment regime. In this study, the possible explanation given is that better patient and practitioner interaction is able bring about an improvement in compliance (Kyngas *et al.* 2000). It is best when the patients and their health care providers discuss and make decisions together on the treatment regime. Such a relationship emphasizes a shared responsibility between the health care provider and the patient and may yield better health outcomes. Patients must have confidence, mutual respect and be committed with their treatment. Patients with part time employment were also found to be more compliant, in contrast with findings from past studies. Working part time is probably less stressful allowing the patient has ample of time to comply with requirements as compared to patients who work full time. Patients who work full time are more likely to be noncompliant because they consume outside food which contain higher sodium levels that lead to a higher consumption of fluid due to thirst (Chan *et al*. 2012 & Baraz *et al*. 2009). However, as for the patients in this study, the hospital based dialysis centers provides the food or snacks for all dialysis patients, so working

patients are able to eat more healthily at least three time weekly on days where they receive dialysis.

This study found no association between demographic factors and knowledge with IDWG compliance improvement. The associations were not significant in the multivariate analysis at 1-month, 3- and 6-month post intervention which is in contrast to the results of a previous study by Rambod *et al.* (2010) which reported that race and education level were significantly associated with compliance and that only a high level of education significantly predicted compliance.

5.11.2 Factors associated with mean predialysis blood pressure (MPBP) compliance improvement at 1-, 3- , and 6-month post intervention

The univariate analysis showed no significant factors associated with MPBP compliance improvement at 1-month. Gender was the only factor associated with MPBP compliance improvement at 3-month post intervention. At 6-month post-intervention, the significant factor associated with MPBP was the duration of therapy. These results are in contrast to Baraz's (2009) study, in which the age factor was associated with compliance. Baraz (2009) discovered that younger aged patients had better compliance but this study showed that older aged patients had more compliance. This was supported by Kauric-Klein (2011), who found older patients to be more compliant with better blood pressure control. The possible explanation is that older people have more routine daily activities, lesser family commitments and more time to accommodate treatment regimes.

Past studies have found no association between demographic variables such as gender, marital status and duration of dialysis therapy as opposed to the study findings. A previous study by Chan *et al.* (2012) supported the findings on age and duration of therapy as predictors. The older aged group maintained the mean predialysis blood pressure (MPBP) at three different series of time: 1-month, 3-month and 6-month which showed that there was an improvement in compliance and is congruent with the study by Chan *et al*. (2012), in that older patients and female patients were more fluid compliant, but working participants and those with a longer duration of dialysis showed lesser compliance.

Significant predictors identified for compliance improvement were the number of concurrent disease and marital status, and this contrasted with the study by Chan *et al.* (2012) who identified female patients, being on a short duration of dialysis therapy, being unemployed and an older age as fluid compliancy predictors. Even though gender and age were not significant predictors, being female and of an older age group were associated with higher compliance. Based on the multivariate results, educational interventions should focus on participants with a higher number of concurrent diseases and on patients who are single to increase MPBP compliance.

5.11.3 Factors associated with rate of adherence (RFA) compliance improvement at 1-, 3- , and 6-month

The univariate analysis showed that none of the factors were significantly associated with RFA compliance improvement at 1-month post intervention. The number of concurrent diseases was the only significant factor found to be associated with RFA compliance improvement at 3-month post-intervention. In the multivariate analysis, duration of dialysis therapy, number of concurrent diseases and the number of

antihypertensive medication were identified as significant factors associated with increase in the proportion of RFA compliance improvement at 3-month. The significant factors associated with RFA compliance at 6-month were the duration of dialysis therapy and number of concurrent diseases. Duration of dialysis therapy was found to be associated with fluid compliance in multivariate analysis, in contrast with a study by Chan *et al.* (2012) which reported that patients who are in longer dialysis therapy tend to be noncompliant. In this study, participants with less than 5 years of dialysis therapy showed lower compliance improvement than those who had more than 15 years of dialysis treatment. The possible contributing factors are the lack of structured teaching and written materials as supported by the study findings. More than 70% patients said that advice on fluid and salt control was only provided when a problem occurred and even then it was delivered only verbally.

Participants with less than two concurrent diseases were found to have lower compliance improvement on the RFA as compared to those with more than two concurrent diseases. This concurred with the study by Pang *et al*.(2001) which reported that patients with one or more comorbid diseases had higher interdialytic weight gain and was nonadherent on their fluid intake. The high prevalence of depression among hemodialysis patients may contribute to the low compliance improvement in RFA. Participants who were taking only one antihypertensive medication showed higher compliance improvement than those who were taking more than one medication. The findings were congruent with those of Sathvik's (2007) study which reported that haemodialysis patients who took a lesser number of medications were more compliant with their medication. A lower number of medications equates to less stress and lesser complexity in following a prescribed medication regime. Patients in this subgroup may be able to concentrate more on the educational intervention provided and improve their

RFA compliance. Based on the findings, it can summarized that patient education is important to enhance fluid compliance. Nurses should be positive in attitude to promote patient compliance. Nurses can improve the situation by showing more sensitivity to patients' verbal and non-verbal communication, empathize and understand their feelings, which can promote compliance as well as increase satisfaction with the care provided (Zrinyi *et al*. 2003).

5.12 Summary

This study was conducted to evaluate the effectiveness of patient education on fluid compliance among haemodialysis patients in hospital based dialysis centers. An educational intervention was carried out, and measurement on knowledge and fluid compliance was taken pre- and post-intervention. The sample characteristics were a close representation of the general group of dialysis patients, homogeneous and had a high response rate. Assessment of knowledge on fluid and salt control showed that there was a significant improvement in mean total knowledge scores post-intervention in the experimental group when compared to the control group.

Patient education was effective as evidenced by the thrice increased rate of knowledge improvement in the experimental group following the intervention. The predictor for knowledge improvement was the use of antihypertensive medication. The fluid compliance level was low pre-intervention but it improved post-intervention. The interdialytic weight gain and rate of adherence showed a significant improvement (two fold and three fold respectively), but the mean predialysis blood pressure did not show improvement post intervention. IDWG and RFA compliance trends showed more improvement at 1-month but decreased slightly at 3- and 6-month. This suggests that

education needs to be structured and that teaching must be continuous to sustain targeted compliance levels.

Patient education improved compliance on the IDWG and RFA by almost five times and eight times respectively, but was not associated with changes on the MPBP post-intervention. Several factors were found to be associated with fluid compliance. The predictors identified were the number of concurrent diseases, marital status for MPBP compliance improvement, education level and duration of dialysis therapy for RFA compliance improvement but no predictors were identified for IDWG compliance improvement.

The results were congruent with some of the previous study findings. It can be concluded that patient education improves patient knowledge and fluid compliance.