Effects of the Supportive-Educative Nursing Program on Self-care Knowledge, Self-care Behavior and Clinical Outcomes of Hypertensive Patients at Risk of Renal Complications

นิพนธ์ต้นฉบับ

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Original Article

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บทคัดย่อ

วัตถุประสงค์: เพื่อประเมินผลของโปรแกรมการพยาบาลแบบสนับสนุนการเรียนรู้ที่มีต่อความรู้ในการดูแลตนเอง พฤติกรรมการดูแลตนเองและผลลัพธ์ทางคลินิก (ค่าไมโครอัลบูมินในปัสสาวะและค่าอัตราการกรองของไต) ของผู้ป่วยโรคความดันโลหิตสูงที่เสี่ยงต่อภาวะแทรกซ้อนทางไต **วิธีการศึกษา:** การวิจัยแบบกึ่งทดลองนี้ใช้การวัดผลก่อนและหลังการทดลองของสองกลุ่ม กลุ่มตัวอย่างที่คัดเลือกตามหลักเกณฑ์ที่กำหนดได้แก่ ผู้ป่วยโรคความดันโลหิตสูงที่เสี่ยงต่อภาวะแทรกซ้อนทางไตจำนวน 50 รายที่มาตรวจตามนัดที่แผนกผู้ป่วยโรคเรื้อรัง โรงพยาบาลบ้านเหลื่อมในจังหวัดนครราชสีมาระหว่างเดือนกรกฎาคมถึงธันวาคม 2559 โดยที่กลุ่มทดลองและกลุ่มควบคุมจะมีผู้ป่วยกลุ่มละ 25 ราย กลุ่มทดลองจะได้รับความรู้ตามโปรแกรมการพยาบาลแบบสนับสนุนการเรียนรู้เป็นเวลา 8 สัปดาห์ร่วมกับคู่มือการดูแลตนเอง สื่อวิดิทัศน์และโมเดลอาหาร ส่วนกลุ่มควบคุมได้รับการดูแลรักษาแบบปกติ เก็บข้อมูลโดยใช้แบบสอบถามที่ประกอบด้วย ข้อมูลทั่วไปของผู้ป่วย ความรู้ในการดูแลตนเองและพฤติกรรมการดูแลตนเอง ประเมินผลลัพธ์ที่สัปดาห์ที่ 1 (ก่อนทดลอง), 8 (หลังทดลอง) และ 20 (ระยะติดตามผล) วิเคราะห์ข้อมูลโดยสถิติเชิงพรรณนา สถิติไคว์สแคร์ ทดสอบค่าที และการวิเคราะห์ความแปรปรวนแบบวัดซ้ำ **ผลการศึกษา:** กลุ่มทดลองมีค่าเฉลี่ยคะแนนความรู้ในการดูแลตนเองและพฤติกรรมการดูแลตนเองหลังการทดลองและระยะติดตามผลสูงกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ (*P*-value < 0.001) ในระยะติดตามผล กลุ่มทดลองมีค่าไมโครอัลบูมินในปัสสาวะต่ำกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ (*P*-value < 0.001) แต่ค่าอัตราการกรองของไตของทั้ง 2 กลุ่มไม่ต่างกัน **สรุป:** โปรแกรมการพยาบาลแบบสนับสนุนการเรียนรู้ทำให้ผู้ป่วยโรคความดันโลหิตสูงที่เสี่ยงต่อภาวะแทรกซ้อนทางไตมีความรู้ในการดูแลตนเองและพฤติกรรมการดูแลตนเองดีขึ้นและทำให้ค่าไมโครอัลบูมินในปัสสาวะต่ำกว่าการให้การดูแลรักษาแบบปกติ

คำสำคัญ: โปรแกรมการพยาบาลแบบสนับสนุนการเรียนรู้, ความรู้ในการดูแลตนเอง, ทักษะในการดูแลตนเอง, ผลลัพธ์ทางคลินิก, ผู้ป่วยความดันโลหิตสูง

Abstract

Objective: To evaluate the effects of a supportive-educative nursing program on the self-care knowledge, self-care behavior and clinical outcomes (i.e. microalbuminuria and renal filtration rate) of hypertensive patients at risk of renal complications. **Method:** This quasi-experimental research employed a pre-test and post-test of two groups. The eligible sample was 50 hypertensive patients at risk of renal complications who were followed up at the chronic disease clinic of Banluam Hospital in Nakhon Ratchasima province during July – December, 2016. A total of 25 patients were in the study group and the rest in the control. The study group received the supportive-educative nursing program for eight weeks together with a handbook of self-care, video clips and food models, whereas the control group was provided by the usual care. Data were collected using a questionnaire that contained the demographic data, self-care knowledge, and self-care behaviour. The evaluation was performed in week 1 as a pre-test, week 8 as a post-test, and week 20 for the follow-up. The data were analysed using descriptive statistics, Chi–square test, independent t–test and analysis of variance (ANOVA) with repeated measures. **Results:** The mean scores of self-care knowledge and self-care behaviour in the study group for the post-test and follow-up were significantly higher than those in the control group (*P*-value < 0.001). At follow-up, the microalbuminuria value in the study group was lower than that in the control group (*P*-value < 0.001), but the renal filtration rate between the two groups was not different. **Conclusion:** The supportive-educative nursing program improved the self-care knowledge, self– care behavior and microalbuminuria of hypertensive patients at risk of renal complications compared with the usual care.

Keywords: supportive-educative nursing program, self-care knowledge, self-care behavior, clinical outcomes, hypertensive patient

Introduction

Hypertension is a major public health problem. According to the World Health Organization, there are billions of people with high blood pressure worldwide; one in three adults has hypertension. In Thailand, it is estimated that by 2025, another 1.56 million people in the world will suffer from hypertension.[1] According to the Policy and Strategy Office, Ministry of Public Health, Thailand, it was reported that in 2011, 2012 and 2013, the prevalent rates of high blood pressure per 100,000 population nationwide except Bangkok Metropolis were 1,187.0, 1,570.6 and 1,629.9, respectively.[2]

It is clear that rates of hypertension have been increasing. As a result, rates of death from high blood pressure from 2011 to 2013 were 5.7 to 7.99 per 100,000 population.[2] Due to the increasing trend of hypertension, the burden on population health in the future has increased. Poor control of high blood pressure could result in severe complications including celebrovascular and cardiovascular events, nephropathy and retinopathy.[3] Based on the 2012 surveillance report on the chronic non-communicable diseases of Thailand year 2012, there were 602,548 newly registered cases of hypertensive patients, with 8,567 cases with complications (1.42%).[4] Of these 8,567 cases with complications, 1,289 chronic kidney disease patients were found (15.05%).

At the Chronic Disease Clinic, Ban Lueam Community Hospital, Nakhon Ratchasima, the number of hypertensive patients had been increasing from 2012 to 2014, from 597 to 746 and 869 patients. Consequently, 157, 213 and 256 patients with chronic kidney disease were found in these three consecutive years.[5] Apparently, chronic kidney disease (CKD) is a serious complication in hypertensive patients. Once developed, CKD affects the patient's quality of life, both physically and mentally. CKD also puts a large burden on the country's economy. Among patients with CKD who require renal replacement therapy, a cost of dialysis treatment of 2 million baht per person per year. At the national level, the overall costs to take care of CKD patients requiring renal replacement therapy will reach 4-6 billion in the near future.[6]

Chronic kidney disease in hypertensive patients was caused by vascular degeneration and uncontrolled blood pressure. This poor blood pressure control is in part due to a lack of knowledge in self-care and medication use. As a consequence, they have a poor adherence to and appropriate use of medications. It was found that 36.6% of the patients did not take the medication on the prescribed time, and 20.0% self-adjusted their medication regimen, especially omitting the dose.[8] In addition, a high consumption of salt has been prevalent as the patients regularly take salty foods and use flavor enhancers, especially in the powder form, which contain a relatively high amount of salt. Most patients did not know that the use of this kind of seasoning causes high blood pressure.[8] This suggests a low self-awareness among hypertensive patients. It was found that self-care knowledge was associated with[9] and predictive of[10]

self-care practice behavior. Poor self-care knowledge is therefore associated with inappropriate self-care behavior, which could further lead to a poor control of blood pressure and subsequently blood vessel degeneration and finally chronic kidney disease.

To prevent renal insufficiency, in addition to the prescribed medications, appropriate self-management behaviors should be encouraged. These self-care behaviors included restricted salt intake, weight control, appropriate exercise, smoking cessation, limited alcohol intake, and stress management.[11,12]

Another strategy to prevent the progress to renal complication among hypertensive patients is the screening for such risk. The patient is screened for the presence of micro-albuminuria which is defined as the 30 - 300 milligrams of albumin per gram of creatitine. Micro-albuminuria is an early predictor or kidney complication with a relatively high specificity.[13] Micro-albuminuria with the estimated renal filtration rate (eGFR), is the standard indicator of the stage of chronic kidney disease among hypertensive patient.[14]

To self-care effectively, the patient with risk of renal complications had to have adequate knowledge as it is a crucial factor for behavior modification.[10] As a result, a supportive and knowledge-oriented nursing system has been developed and called the supportive-educative nursing program. It is to create a balance between the patient's ability for self-care and their desire for self-care. The supportive-educative nursing program was associated with an increase in knowledge and behavior of self-care with statistical significance.[15,16] Based on literature review in the population with a risk of hypertension, patients with chronic kidney disease undergoing dialysis, and patients with other illnesses, the factors leading to chronic kidney disease included various illnesses, uncontrolled blood pressure, inappropriate behaviors such as smoking, and poor medication use.[17] The consumption of high-sodium food intake with various kinds of seasoning also causes uncontrolled blood pressure. The patient do not know that seasonings could make controlling blood pressure more difficult.[18] In addition, these hypertensive patients are less likely to exercise, more likely to be overweight, poorly compliant to appointment, and mentally stressed.[19,20] In addition to these poor health behaviors, a lack of knowledge in proper diet and adherence to medication[7] and receiving

advice not specific to the patient's problem[8] made it difficult for the patient to be aware of self-care and hence the uncontrolled blood pressure which could further lead to vascular degeneration and chronic kidney disease.

It is evident that hypertensive patients lack knowledge in self-care and have inappropriate self-care behaviors. A number of hypertensive patients with a risk of renal complication have been increasing in general and at Banluem Hospital. Even though the supportive-educative nursing program has been implemented, but a large demonstration group usually leads to giving advice not specific to problems of a certain number of patient attendees. In our present study, we provided the supportive-educative nursing program to small groups of patients, i.e., 5 – 6 patients per group. The program was based on Orem's theory.[10] This small group training could allow for experience sharing among participants. The training team was multidisciplinary. We also used phone call to follow-up, evaluate the progress, and encourage the participant to engage in healthy behaviors.

In this present study, we aimed to determine the effects of the supportive-educative nursing program on self-care knowledge and self-care behavior as measured by questionnaires at pre-test (week 1), post-test (week 8) and follow-up (week 20). We also determined albuminuria as albumin (milligram) per gram of creatitine and renal filtration rate at pre-test and follow-up. The differences of these measures between the study and control groups were examined.

Methods

In this quasi-experimental research, pre-test, post-test design with two groups of subjects was used. The effects of supportive-educative nursing program among hypertensive patients with a high risk of kidney complication were tested. The study population was 613 patients diagnosed with hypertension who were followed up at the chronic disease clinic, Ban Lueam Community Hospital, Naknon Ratchsima, from July to December 2016. The sample consisted of hypertensive patients eligible for the study based on the inclusion criteria. They had to have a blood pressure of 140/90 mmHg or higher, eGFR within a range of 60 – 100 mL/min/1.73 m^2, (i.e., CKD stage 1 to 2), albumin creatinine ratio of 30 – 300 mg albumin / gm creatinine, no diabetes mellitus, and no serious complications such as hypertensive crisis, congestive heart failure, or stroke. They had to be willing to participate. Those unable to participate the entire program were excluded.

Sample size estimation was based on Glass's delta effect size.[21] Based on an effect size of 0.9, a confidence level of 95%, and a power of 80%, a sample of 25 subjects for each group was needed for the one-sided test. A total of 50 patients were recruited.

In the sample selection process, the prospective participants' blood pressure, albumin creatinine ratio and kidney filtration rate were determined one week before starting the program. Once found eligible for the study, those attending the clinic on Monday were assigned to control group (usual care) and those attending on Tuesday to the study group (supportive-educative nursing program).

Study instruments

In this quasi-experimental study, two types of instruments, those for conducting the supportive-educative nursing program, and those for outcomes evaluation, were used.

The materials for the supportive-educative nursing program

We created supportive-educative nursing program for hypertensive patients with a risk of renal complications by modifying the relevant programs from previous research and literature. Aiming at reducing the risk of renal complication progression, this supportive-educative nursing program was modeled after the nursing concept of Orem's theory.[10] Basically the program provided knowledge relevant to the prevention of renal complications, and encourage self-care behaviors necessary for such prevention. Based on the supportive-educative approach, four activities were planned. First, the team provided psychological support by means of creating relationship with the participants at the educational session at the hospital and at three phone call follow-ups, specifically at week 2, 4 and 6. At each phone call follow-up, the participants were also evaluated for the self-care knowledge and self-care behavior and encouraged to practice more self-care behaviors. A handbook of home-based self-care was provided to all participants. Second, the problems of the participants' self-care behaviors were assessed and the goals of behavior improvement specific to

given participants were provided. The participants were allowed to make their own decision to adopt the guided behaviors as they saw fit. These desirable behaviors were, for example, the awareness of poor diet control, exercise, and stress management. The program employed the actual practice of the participants, especially on exercise and diet control, with the demonstration and feedback by the training team. Third, the training team provided self-care knowledge for hypertensive patients to reduce the risk of renal complications. Fourth, the environment encouraging self-care behaviors was created by allowing the participants share their own experience in self-care. The activities of teaching and group sharing took place at the hospital at week 1 and 8 of the program. Teaching plans based on these four components were detailed. In terms of educational materials, a handbook, a video clip and plastic food models were used. The 20-page **self-care handbook** about hypertension with the risk of renal complications was created by the researcher as guided by relevant literature. The educational video clip about hypertension was provided by Thai Health Promotion Foundation (2014). Plastic food models were those demonstrating food items suitable for blood pressure control.

Data collection instruments

For data collection instruments, the first set of questions asking the participant's demographic and health status information including age, gender, monthly income, educational level, blood pressure, body mass index, renal filtration rate, and albumin creatinine ratio. The second set of questions asked the participants about hypertension self-care knowledge and the reported practice of their self-care behaviors. For the knowledge questions, there were 12 positive and 4 negative statements. A score of 1 point was given to the correct response and 0 point for the incorrect response. The possible total score could be from 0 to 16 points where higher scores indicated a higher level of self-care knowledge.

For the questionnaire on the reported practice of self-care behaviors, it was created by the researcher from previous literature. The orientation of the questions was guided by Orem's theory of nursing care.[10] There were 12 statements with positive meaning of behavior and 10 negative statements. The participant was asked how often they carried out such self-care practice. The response was a 4-point Likert-type rating scale ranging from 0 "never" to 1 "sometimes," 2 "often" and 3 "always." To be more specific to the participants, "never" was defined as never having practiced such activity at all, "sometimes" meant that the participant was not active in that matter or had practiced such activity for 1 or 2 days a week. While "often" was defined as having practiced such activity for 3 to 4 days a week, "always" was referred to at least 5 days a week the participant had performed such activity. Scores of negative statements were reversed. The possible total scores were 0 to 66 points where higher scores indicated a higher level of self-care behavior.

The values of clinical outcomes were obtained from laboratory tests. These included the albumin creatinine ratio and renal filtration rate.

In addition, the form to record phone call follow-up on self-care behavior and the form for problem summary were created by the researcher.

Research instrument quality assurance

All instruments were tested for validity and reliability. These instruments included the supportive-educative nursing program with the detailed teaching plans, self-care handbook, the form to record phone call follow-up on self-care behavior, the form for problem summary, questionnaire on knowledge about self-care and questionnaire on self-care behavior. Content validity of all instruments was examined by five experts including one physician specialized in internal medicine, two nursing instructors with an extensive experience in hypertensive patient care, and two nurses specialized in hypertensive patient care. In terms of activities, the format, order and timing were considered. For questionnaires and teaching materials, language and content were considered. All suggestions were used to revise the instruments. The questionnaire on knowledge about self-care and questionnaire on self-care behavior had a high level of content validity with content validity index of 0.89 and 0.85, respectively.

Reliability of the questionnaire on knowledge about self-care and questionnaire on self-care behavior was tested in 30 individuals comparable to the participants.[22] The questionnaire on knowledge about self-care had a high internal consistency reliability with a Kuder-Richardson reliability coefficient of 0.84. The questionnaire on self-care behavior also had a high internal consistency reliability with a Cronbach's alpha coefficient of 0.87.

Data collection

This study was approved by the Institutional Review Board (IRB) for Graduates Studies (approval no. 12-03-2559, approval date April 11, 2016), Faculty of Nursing, Burapha University, Thailand. The researcher obtained permission to conduct the study from the director of Ban Lueam Hospital, and assistance from the head of the chronic diseases clinic of the hospital. The researcher determined the control and study groups by randomly selecting the days for conducting study. As a result, patients attending the clinic on Monday were assigned to the control group and those attending the clinic on Tuesday were assigned to the study group. On the day of the clinic visit, the participants were selected based on the inclusion criteria. The patients who met the inclusion criteria were approached. Research project information and human right protection were provided to the patients. Researchers fully explained the purpose of the study, contents of the questionnaire, the right to withdraw from the study any time, and anonymity of the data collected. The cancellation from the study would not affect the medical treatment they routinely received. The participants were asked to sign the informed consent. The study procedures were as follows.

The study group received the care based on the supportive-educative nursing program for eight weeks. In week 1, there were asked to complete the pre-test questionnaire including demographic and health status, self-care knowledge for hypertension and self-care behavior as described previously. Their pre-test clinical outcomes, i.e., albumin to creatinine ratio and renal filtration rate, were also obtained. After completing the questionnaire, each group of 5 – 6 participants attended the training session which lasted about 4 hours. Various training activities were carried out. First, to motivate the participants to engage in the process of identifying their own problems, open-ended question such as "what behaviors of yours do you think causing your uncontrolled blood pressure?" was asked. Second, self-care knowledge topics were taught with various teaching techniques including video clips. The topics included hypertension, the risk of renal complications, treatments, medications and adverse effects, diet control, the effects of alcohol and smoking, stress management, and adherence to treatment and appointment. In teaching the topic of diet for hypertensive patients, a nutritionist used plastic food models as the teaching aid. For exercise, a physical therapist led the participants in the exercise session. Participants had an opportunity to practice of the diet control and exercise under the supervision of the training team. Third, the handbook of self-care to reduce the risk of renal complication was provided to all participants. Fourth, for psychological support, training team encouraged participation in all activities, and helped the participants relax. Fifth, to make the environment suitable for learning, quiet private space was set. Interference or obstruction of the learning process was minimized.

At week 2, 4 and 6, the researcher made the weekly phone calls for follow-up. Participants were asked if they had any problems or concerns in practicing self-care. If so, advice and encouragement were given. The call took about 15 – 20 minutes.

At week 8, the participants in the study group attended the training session at the hospital to share experience and difficulties in practicing self-care. This small group of 5 – 6 participants allowed them to identify their problems. Options appropriate for individual participants to solve the problems were also discussed. This session took about an hour to complete. They were also asked to complete the questionnaires of self-care knowledge and self-care behavior (post-test).

At week 20, a 45-minute session was held to assess the self-care knowledge and self-care behavior for the second time (follow-up test). Clinical outcomes were also obtained.

For those in control group, they received the usual care with the handbook for hypertensive patients to reduce the risk of renal complications. They were asked to complete the pre-test questionnaire similarly to those in study group. Their clinical outcomes were also obtained. At week 8, they were asked to complete the questionnaires similarly to those in study group (post-test). At week 20, the follow-up questionnaires were also completed. Similar to participants in the study group, their clinical outcomes were obtained.

Data analysis

A statistical software package was used for analysis. Descriptive statistics were used to describe demographic characteristics and health status of the participants. To compare differences between the two groups, independent t-test was used to test the difference of the mean albumin to creatinine ratios and renal filtration rate at week 20 (at follow-up). All independent t-tests were found to be eligible

since all assumptions for the test were met. To test the differences of the mean scores of self-care knowledge and self-care behaviors between the two groups, repeated measures analysis of variance was used to account for the change over time. Pair-wise comparisons were carried out with Bonferroni adjustment to handle the inflated type II error. Statistical significance for all analyses was set at a type I error of 5%.

Results

The majority of the participants in the study group were female (64%), with the age range of 41 - 50 years with a mean of 49.44 years (SD = 1.145). Most of them had primary education (72%), and engaged in agricultural occupation (80%). About half of them had a monthly income of less than 5,000 baht (52%). Most of them had no family history of hypertension (64%). The majority did not drink alcohol (88%). Almost all of them did not smoke (96%). The mean duration of hypertension was 2.93 years (SD = 0.300). Almost two-thirds had their systolic blood pressure in a range of 140 – 159 mmHg (grade 1) (64%) and 48% had a grade 1 high diastolic blood pressure (90 – 99 mmHg). Almost two-thirds received calcium channel blockers as their anti-hypertensive medications (64%). It was found that 36% of them had hyperlipidemia.

For those in control group, the majority were female (76%), in an age range of 41 - 50 and 51 - 60 (44% for both ranges). The mean age was 49.92 years (SD = 1.210). They had primary school education (84%) and agricultural occupation (72%). Their monthly income was less than 5,000 Baht (48%). About two-thirds had a family history of high blood pressure (64%). The majority did not drink alcohol (88%) or smoke (96%). Most of them had a duration of 2 and 4 years of hypertension with a mean duration of 2.84 years (SD = 0.275). Almost two-thirds had their systolic blood pressure in a range of 140 – 159 mmHg (grade 1) (64%) and 64% had a grade 1 high diastolic blood pressure (90 – 99 mmHg). Calcium channel blockers were given in 80% of the participants. Only 16% had hyperlipidemia.

The results showed that, among participants in the study group, the scores of self-care knowledge continuously increased from a mean of 11.84 points (SD = 1.65) at pre-test to 14.80 points (SD = 0.95) at post-test (week 8) and 15.20 points (SD = 0.82) at follow-up (week 20). Among

participants in the control group, their self-care knowledge scores increased from a mean of 10.44 points (SD = 1.41) at pre-test to 11.28 points (SD = 1.33) at post-test. However, at follow-up, the score slightly decreased (M = 11.08, SD = 1.52) (Table 1).

In terms of self-care behavior, the scores in the study group increased from a mean of 39.72 points (SD = 2.40) at pre-test to 48.04 points (SD = 3.54) at post-test (week 8) and 51.20 points (SD = 2.76) at follow-up (week 20). Among participants in the control group, their self-care behavior scores increased from a mean of 40.60 points (SD = 2.29) at pre-test to 42.40 points (SD = 2.38) at post-test. However, at follow-up, the score slightly decreased (M = 41.56, SD = 2.50) (Table 1).

Table 1 Mean scores of self-care knowledge and self-care behavior between the two groups at different time points (N = 50).

| | Mean scores with SD at different time points | | | | | |
| | Pre-test (week 1) | | Post-test (week 8) | | Follow-up (week 20) | |
	Mean	SD	Mean	SD	mean	SD
Knowledge score						
Study group	10.84	1.65	14.80	0.95	15.20	0.82
Control group	10.44	1.41	11.28	1.33	11.08	1.52
Behavior score						
Study group	39.72	2.40	48.04	3.54	51.20	2.76
Control group	40.60	2.29	42.40	2.38	41.56	2.50

Based on the repeated measures ANOVA, mean scores of knowledge and behavior between the two groups were statistically significant (P-value < 0.001 for both scores) (Table 2). Based on within group analysis, significant results of time-points terms and groups x time-points interaction terms indicated that mean scores of knowledge and behaviors of the study group were different from those of the control group (P-value < 0.001 for all).

Based on Bonferron's adjustment, mean differences in the scores of knowledge at pre-test compared with post-test and pre-test with follow-up were statistically significant (P-value < 0.001 for both) while that of post-test and follow-up was not (Table 3). In terms of behavior scores, the mean differences of the scores of each of the three pairs of the three time-points were statistically significant (P -value < 0.001 for all three pairs).

Table 2 Comparisons of mean scores of self-care knowledge and self-care behavior by repeated measures ANOVA between two groups at pre-test, post-test and follow-up (N = 50).

Source of variance	SS	df	MS	F	P-value
Knowledge score					
Between groups					
Groups	269.34	1	269.34	105.57	< 0.001
Errors	122.45	48	2.55		
Within group					
Time-points	200.33	2	100.16	75.15	< 0.001
Groups x time-points	99.72	2	49.86	37.41	< 0.001
Errors	127.94	96	1.33		
Behavior score					
Between groups					
Groups	864.00	1	864.00	60.54[a]	< 0.001
Errors	685.04	48	14.27		
Within group					
Time-points	1093.96	1.36	801.77	149.55[a]	< 0.001
Groups x time-points	704.92	1.36	516.64	96.36[a]	< 0.001
Errors	351.12	65.49	5.36		

[a] Based on Greenhouse' s Geisser statistics.

Table 3 Mean differences of self-care knowledge and self-care behavior scores between time-points based on Bonferroni's adjustment (N = 50).

	Mean difference between time-points*					
	T1 vs. T2	P-value	T1 vs. T3	P-value	T2 vs. T3	P-value
Self-care knowledge	2.400	< 0.001	2.500	< 0.001	0.100	1.000
Behavior	5.060	< 0.001	6.220	< 0.001	1.160	< 0.001

* T1 = pre-test (week 1) ,T2 = post-test (week 8), T3 = follow-up (week 20).

Based on inclusion criteria, all participants in study and control groups had microalbuminura (i.e. 30 – 300 albumin / gm creatinine). At week 1, the mean levels of albumin were 41.88 ± 11.24 and 44.96 ± 16.24 mg/gm creatinine, for study and control groups, respectively (Table 4). At follow-up (week 20), microalbuminuria in study group (23.92 ± 8.31) was significantly lower than that in control group (43.80 ± 22.26) (P-value < 0.001).

Table 4 Microalbuminuria between the two groups (N = 50).

	N	Mean (SD) (mg albumin / gm creatinine)				t*	P-value
		Pre-test (week 1)		Follow-up (week 20)			
		Mean	SD	mean	SD		
Study group	25	41.88	11.24	23.92	8.31	4.183	< 0.001
Control group	25	44.96	16.24	43.80	22.26		

* Means of the two groups at follow-up were compared.

It was found that, at follow-up, the renal filtration rate in study group (98.15 ± 12.74 mL/min/1.3 m^2) was slightly higher than that in control group (95.64 ± 14.90 mL/min/1.3 m^2) with statistical significance (Table 5).

Table 5 Renal filtration rate between the two groups (N = 50).

	N	Mean (SD) (mg albumin / gm creatinine)				t*	P-value
		Pre-test (week 1)		Follow-up (week 20)			
		Mean	SD	mean	SD		
Study group	25	88.04	18.35	98.15	12.74	0.639	0.526
Control group	25	92.86	19.94	95.64	14.90		

* Means of the two groups at follow-up were compared.

Discussions and Conclusion

Among hypertensive patients with a risk of renal complications, patients receiving supportive-educative nursing program had higher scores of self-care knowledge than those receiving usual care (P-value < 0.001). This finding could be explained as follows. The participants joined a small group discussion of 5 – 6 patients in a private place with demonstration and actual practice of various self-care activities. They were also encouraged with experience sharing and a series of phone call follow-up. These psychological supports could have had significant impact on acquiring their knowledge. The difference of knowledge score from pre-test (week 1) to follow-up (week 20) was 2.5 points (P-value < 0.001).

Patients in the supportive-educative nursing program also had self-care behavior scores at post-test and follow-up higher than those who received usual care (P-value < 0.001). To prevent renal complications, the patient needed to self-care effectively. The self-care knowledge was needed to augment the self-care behavior.[10] In our study, participants in the supportive-educative nursing program had been educated by various education techniques. They were also encouraged and motivated to engage in self-care behavior by various means such as experience sharing in small group training, and a series of phone call follow-ups. Their scores of self-care knowledge and self-care behavior could therefore be maintained through the follow-up. This finding was consistent with the study of Seetisan and colleagues (2012) where patients with high level of knowledge about illness and treatment had a high level of self-care behavior.[23] A study of Laloon found that knowledge about hypertension

was positively associated with self-care behavior of hypertensive patients (*P*-value < 0.05).[24] A study by Khongseua (2014) also found that supportive-educative nursing system positively affected diet self-care behavior among cardiovascular patients undergoing percutaneous transluminal coronary intervention.[25]

The supportive-educative nursing system could help balance between the actual ability to self-care and the desire to self-care. As a result, participants in the study group had higher scores of self-care knowledge and self-care behavior. This was consistent with the study of Kummak and colleagues which found that knowledge was associated with self-care behavior among hypertensive patients (*P*-value < 0.05).[9] Knowledge was also found to significantly influence self-care behavior.[10] Therefore, supportive-educative nursing system significantly improved the patient's self-care knowledge and self-care behavior.

Participants receiving supportive-educative nursing program had a lower level of urinary albumin (mg) per creatinine (gm) than those in control group at follow-up (week 20) (*P*-value < 0.001). High blood pressure causes narrowing blood vessels which further cause a reduced volume of the renal blood flow. Ischemia in glomerulus could lead to the impairment. Finally, chronic kidney disease is developed.[26] As previously described, the supportive-educative nursing system could help balance between the actual ability to self-care and the desire to self-care. As a result, participants in the study group had higher scores of self-care knowledge and self-care behavior. The better self-care behavior could result in a better clinical outcome.[10]

Better scores of self-care behavior could also slow down the progression to kidney function impairment through the better control of blood pressure. It was found that in the study group, the participants' SBP and DBP at pre-test were 145.20 and 86.40 mmHg, respectively (data not shown). At follow-up, their SBP and DBP decreased to 134.40 and 79.60 mmHg, respectively (data not shown). The supportive-educative nursing program could have influenced the progression of the kidney function.

In terms of renal filtration function, participants in the study group had a mean level of renal filtration rate at follow-up slightly higher than that in the control group with no statistical significance. In this study, we recruited patients with early stages of chronic kidney diseases (stages 1 and 2 or eGFR of 60 – 100 mL/min/1.73 m^2). Their renal filtration

function was relatively well preserved. In patients with essential hypertension, the progression to later stages of chronic kidney diseases depends on the duration of their hypertension.[11] Other factors influencing the progression included gender, age and other urinary tract disorders.[27] Those with the age of 60 years or older had a four-fold risk of renal filtration impairment compared with their younger counterpart. It has been well known that renal filtration rate decreases with increasing age. Among individuals with 30 years of age or older, an annual incident of 7.2% chronic kidney disease is found. In our study, about two-thirds of the participants were female (64.0%). They had a mean age of 49.44 years and been diagnosed with hypertension for 2.93 years. It was evident that participants in our study were with a relatively low risk of renal impairment. Women were less likely to have behaviors detrimental to their renal function. The majority of these women did not drink alcohol (88.0%) or smoke (96.0%). In addition, a study duration of 20 weeks was considerably short for the change of this renal outcome. With all these reasons, participants' renal filtration rate was less likely to be affected by their hypertension. Hence there was no difference of the renal filtration rate between the two groups at follow-up.

Even though the renal filtration rate between the two groups was not different at follow-up, the rate in the study group increased from 88.04 (SD = 18.35) ml/min/1.73 m^2 at pre-test to 98.15 (SD = 12.77) ml/min/1.73 m^2 at follow-up. This could be attributable to beneficial effects of the supportive-educative nursing program. Better scores of self-care behavior could also slow down the progression to kidney function impairment through the better control of blood pressure. It was found that in the study group, the participants' SBP and DBP at pre-test were 145.20 and 86.40 mmHg, respectively (data not shown). At follow-up, their SBP and DBP decreased to 134.40 and 79.60 mmHg, respectively (data not shown). The supportive-educative nursing program could have slowed down the impairment of the kidney filtration function.

In conclusion, supportive-educative nursing program improved self-care knowledge and self-care behavior compared with the usual care. The program also resulted in a lower level of albuminuria.

The study suggests that multidisciplinary healthcare providers could improve the patient's self-care behavior by various techniques including phone call follow-up as

indicated by this supportive-educative nursing program. However, with a limited range of hypertension severity and renal function impairment of the participants in our study, we recommend future studies in patients with higher blood pressure and more severe renal function impairment. We also recommend studies with a longer study period to adequately capture the change of renal function. A broader context in terms of the level of healthcare setting as well as a larger sample size should also be considered in future studies.

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