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Research article

Health Knowledge and Effectiveness of Behavior Improvement due to the intervention of Healthcare Programs for Early Stages of Chronic Kidney Diseases

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Abstract

This study aims to evaluate what effects intervention healthcare programs for early stages of chronic kidney disease have on the patient's knowledge about health and behavior, so as to delay deterioration in their kidney function.

This study adopts the quasi-experimental design with each independent instance of health education acting as an intervention measure. The participants for this study consist of outpatients from a certain regional hospital in Southern Taiwan, and cases were screened for their suitability for this study using the MDRD (Modification of Diet in Renal Disease) equation for glomerular filtration rate. These cases include chronic kidney disease (CKD) patients and patients suffering from stage 1, stage 2, and stage 3a of the disease with cases from the nephrology department forming the experimental group, and cases from other departments forming the control group. All subjects were recruited for this study from March 2011 to March 2012 and a total of 248 cases were gathered: 127 for the experimental group and 121 for the control group.

Through a two-way mixed ANOVA, we found that differences in both knowledge and behavior are generated in each group, before and after the intervention, and an interaction exists between these differences. After further verification using simple main effect test, we found that, after the intervention, the experimental group exhibited an improvement in both its knowledge and behavior that showed statistical significance. For the control group, on the other hand, only knowledge exhibited any difference, while no statistical significance was exhibited in terms of behavior.

Given how the intervention of healthcare programs, during early stages of CKD, brings about significant improvement to the patient's health knowledge and behavior, it is important that the promotion of this nursing care program be continued, so as to thereby achieve a delay in the deterioration of kidney functions.

Keywords: Earlier-stage chronic kidney disease, quasi-experimental design, individualized health education

Introduction

According to statistics in the 2012 United States Renal Data System, Taiwan is one of the world's top 3 in terms of incidence and prevalence of end stage kidney disease, since there have been 361 cases per a million persons of the former, and 2,584 cases per a million persons of the latter.[1] Since the symptoms of early stage kidney diseases are very easy to miss, most patients are already in stage 3 when the disease is finally diagnosed. According

to results from National Health Research Institute's (NHRI) cohort studies, there are 2.03 million people suffering from CKD, with stage 1 to stage 3 patients amounting to 1.97 million. However, only 3.5% of these patients know that they have CKD.[2] At the same time, this study also calculated the mortality rate of CKD in Taiwan to be 10.3%.

With CKD prevalence on the rise, the world has started to increase its focus on this subject. According to studies conducted in Taiwan, as well as in other countries, global prevalence stands at approximately 10%. In Taiwanese territories, the cohort study by the National Health Research Institutes(NHRI), which involved 462,000 persons above the age of 20, showed that the prevalence of stage 1 stands at 1.0%, stage 2 at 3.8%, stage 3 at 6.8%, stage 4 at 0.2%, and stage 5 at 0.1% .[2] The results from a community screening of residents above the age of 40 undertaken by 35 hospitals and clinics in Taoyuan County between 2004 and 2006, showed that the prevalence of patients of different gender stands at 15.2% for stage 3, 0.7% for stage 4 and 0.2% for stage 5. In this screening, the CKD prevalence for male patients stood at 18.8%, and the prevalence for females at 14.0%. Studies also show that the prevalence increases as age increases. This is especially applicable after age 60, where each yearly increase in age brings on a higher probability of CKD than each yearly increase did before the age of 60.[3]

The Pre-End Stage Renal Disease (Pre-ESRD) preventive programs and patient education programs were introduced specifically for stage 3b, 4, and 5 CKD patients by the National Health Insurance. The Taiwan Society of Nephrology has demonstrated that the case management programs are effective in delaying in kidney function deterioration. According to the Taiwan Renal Data System, the prevalence has dropped from 424 cases per million persons to 347 cases per million. Chen et al., with stage 3 to stage 5 cases referred from medical institutes and regional hospitals serving as study population, discovered that, after a tracking period lasting from 2001 to 2006, cases that underwent CKD treatment through referrals exhibited a slowdown, wherein their glomerular filtration rate decreased annually.[4] A study by Wei et al. indicated that, in addition to CKD referrals, the quality of nursing care could also be improved, while the usage rate for medical services could be lowered and medical expenses could be reduced.[5] A study on the comparison between early referred cases and late referred cases showed that the higher mortality rate by late referrals (relative risk=1.99). Late referred cases also exhibited a higher mortality rate and hospitalization rate than early referred cases did.[6] St. Peter et al. also discovered that CKD healthcare intervention, through a diverse set of medical services, could help improve any complications brought about by CKD.[7] Another study has found that, after an investigation of 726 cases consisting of stage 3 to stage 5 patients, the course of the disease could be mitigated and greater survivability could be ensured after a referral for CKD treatment.[8]

In recent years, Taiwan has actively promoted programs for the prevention of kidney disease. These programs have been effective in delaying the deterioration of kidney function, thus lowering the incidence and prevalence of ESRD. In order to further reduce the incidence of dialysis cases, disease management for early CKD cases (namely stage 1, 2, and 3a patients) is also being actively promoted. With a medical team to deliver comprehensive and correct nursing care, and through the prevention, reduction or delay of kidney function deterioration, the load on healthcare can therefore be lightened. Recent references as to whether healthcare programs for early stages of CKD are effective against the mitigation of the disease, however, are still very limited. This study, therefore, aims to make an initial investigation into whether these healthcare programs are effective in expanding knowledge regarding health and patient behavior for early stages of CKD. Through this expansion, it is hoped that the deterioration of kidney functions can be improved upon and delayed.

Materials and Method

This study used the quasi-experimental design. The data was collected through the Institutional Review Board, and with the permission of people suffering early stages of CKD. Each independent instance of health education served as an intervention measure for the patients, and a comparison between their health knowledge and behavior was carried out in order to identify the differences between them. This study invited outpatients from a certain regional hospital in Southern Taiwan to be participants. Among these patients who were in early stages of CKD, all invited between March 2011 and March 2012, those invited by the nephrology department, which amounted 127 patients, formed the experimental group, and those invited by other departments, with amounted 121 patients, formed the control group.

Early stage CKD used, as reference, the current internationally recognized MDRD equation for glomerular filtration rate, which is written as $186 \times SCr^{-1.154} \times Age^{-0.203} \times 0.742$ (female), and the value for this filtration rate served as the periodic record of CKD. The definition of early stage CKD, as adopted by this study, is defined as follows: (1), CKD stage 1: Normal kidney function with signs of kidney damage such as proteinuria and hematuria, as well as patients suffering from diseases exhibiting eGFR≧90 ml/min/1.73 m^2 ＋UPCR≧150mg/gm (or U_{ACR}≧30 mg/gm in diabetic patients). (2), CKD stage 2: Mild chronic kidney failure with afflictions such as proteinuria and hematuria, as well as patients suffering from diseases exhibiting eGFR 60 - 89.9 ml/min/1.73 m^2 ＋UPCR≧150 mg/gm (or U_{ACR}≧30 mg/gm in diabetic patients). (3), CKD stage 3a: Intermediate chronic kidney failure, as well as patients suffering from diseases exhibiting eGFR 45 - 59.9 ml/min/1.73 m^2.

Definition of proteinuria: Urine protein and creatinine ratio（UPCR）≧150mg/gm.

The reference value for creatinine in the blood stream was set at 0.5-1.3mg/dL. Any increase would be viewed as an abnormality.

After a doctor attended to the control group of this study, healthcare personnel in the outpatient department would hand out kidney healthcare brochures and booklets: an act referred to as "common outpatient practice" for this study. For the experimental group, in addition to the common outpatient practice, the patients also received independent 1-to-1 healthcare coaching sessions, for a total of 3 sessions, in a specially prepared room for the duration of the intervention. The 1st session, also referred to as "intervention commencement", included such content as: "knowing the structure and functions of kidneys", "Introduction to the common symptoms of kidney diseases and diagnosis" and "Daily care and preventive measures for kidney diseases". These topics would evaluate the patients' conditions and provide them with individual care. They would also serve as their motivation for learning; the 2nd session, which took place 3 months after the interventions began, included content such as: "the Importance of periodic tracking", "Items of attention during drug administration" and "Kidney biopsy and referral to nephrology specialists". In this phase, the test results were discussed with the case patients, test records were provided according to need, and misconceptions were duly clarified. The 3rd session, which took place 6 months after the interventions began, included content such as: "Understanding the relationship between high blood cholesterol, high blood pressure, diabetes and kidney diseases" and "Controlling blood pressure, blood sugar, weight and the body mass index (BMI)". During this phase, suitable care was provided according to the attributes of the patient's disease, the self-monitoring capabilities of the patient, as well as the level of cooperation from the patient's family, so as to reduce the patient's difficulty in caring for himself/ herself.

In accordance with the funding proposal for early stage CKD by the National Health Insurance Administration, a pretest would be conducted before each new case was accepted. A posttest was administered 3 months after the case and another posttest was administered 9 months after the case. The test items included physiological and biological examinations, health knowledge and behavior.

The instruments for this study consisted of questionnaires and results from physical tests. The questionnaire included contents such as basic information and evaluation scales for health knowledge and behavior, while the physical test results consisted of physical checks and blood and urine tests. The full contents were as follows:

1. Questionnaire

(1). Basic Information: Information such as gender, age, education level, occupation, smoking and drinking habits.

(2). Evaluation scales rating health knowledge and behavior. This was drafted with the permission of the Ministry of Health and Welfare, with reference to section 3 (disease prevention) and section 5 (personal health behaviors) of the "2009 National Health Interview Survey for Persons above 12 years-old", jointly organized by the Health Promotion Administration of the Ministry of Health and Welfare, the National Health Research Institute and the Food and Drug Administration, and also through local and foreign literature. A true-or-false questioning model was adopted for health knowledge evaluation. Here a 'true' had a value of 1 point, while "False" (including "I don't know") was 0 points. The total points ranged from 0 to 12 with a higher score representing better health knowledge. The passing score adopted by this study was set at ≧6, while a score of ＜6 would constitute a fail. For health behavior, the Likert 3-point scoring model was adopted. Answering "Always" would earn the patient 2 points, a "Sometimes" 1 point, and a "Never" 0 points. The total points ranged from 0 to 22 with a higher score representing better health behavior. For this study, a score of ≧11 was considered good, while a score of ＜11 was considered bad.

2. Physical test values

(1). Physical Checks: Checks included height, weight, BMI, systole pressure, diastole pressure

(2). Height and weight measurements: Height was measured to the nearest 0.1 cm, without shoes, using a stadiometer. Weight was measured in light clothing, without shoes, using a beam balance scale, and was recorded to the nearest 0.1kg.

(3).BMI Measurement: Body Mass Index (BMI) = Weight (kg)/ height (m^2)

(4). Blood pressure measurement: Well-trained nurses measured the systolic blood pressure (SBP) and diastolic blood pressure (DBP) two times in the left arm of seated participants according to a standardized protocol. A third BP measurement was made if the first two BP readings differed by more than 10 mm Hg. The average of the two closest readings was calculated to determine the reported BP for each participant.

2) Blood tests: The mandatory test items for the blood tests included creatinine, low-density lipoprotein cholesterol (LDL-C) and Glycated hemoglobin (HbA1c). A fasting period of 8 hours was required for items that prohibited the

intake of food. The amount of blood drawn was 4ml, with 3ml in vacutainers and 1ml of EDTA whole blood. The Hitachi 7170 bioanalyzer and CLC385 glycohemoglobin analyzer were used for the blood analysis.

(5). Urine test: To prevent any contamination by secreted materials at the end of the urinary tract, midstream urine was collected as a test specimen. After collection, using clean specimen cups, at least 8ml of specimen was poured into urine centrifuge tubes.

3. Validity of questionnaire

Six Nephrology specialists were asked to verify the integrity of all the content in the questionnaire, and a content validity index (CVI) was carried out. As seen in Table 1, the CVI value for the health knowledge and behavior questionnaire was significantly promising, proving its suitability.

Table 1: Test for content validity index

Name of questionnaire	Number of questions	CVI Value
Health Knowledge	12	0.97
Health Behavior	11	0.98

Statistical Analysis

The present study analyzed data using SPSS 18.0 (SPSS for Windows release 18.0), with a significance level of $\alpha = .05$. Descriptive statistics used the average value, the standard deviation, the frequency distribution, and the percentage criterion. In addition, the chi-square test, independent-samples t test, and paired-samples t test were applied to compare the differences, before and after intervention, in both groups. Furthermore, a mixed-design two-way ANOVA was applied for testing the differences in grouping factors as well as in the period before and after the intervention of individual health education for both groups.

Results

The basic characteristics data from various physical examinations, health knowledge, and health behavior of participants from the experimental group and control group were not statistically significantly different (Table 2).

Table 2: Attributes, physical examination data, health knowledge and behavior analysis of the experimental group and the control group (N=248)

Variables	N (%)/Mean±SD Experimental group (N=127) N (%)/Mean±SD	N(%)/Mean±SD Control group (N =121) N(%)/Mean±SD	χ^2 /t	P-Value
Age	64.33±12.24	67.07±11.90	-1.783	**.076**
Age			2.589	**.274**
< 40	3(2.4)	3(2.5)		
40-60	41(32.3)	28(23.1)		
>60	83(65.3)	90(74.4)		
Gender			0.029	**.865**
Male	79(62.2)	74(61.2)		
Female	48(37.8)	47(38.8)		
Education Level			4.169	**.124**
Illiterate	48(37.8)	59(48.8)		
Elementary/ Junior High	52(40.9)	46(38.0)		
Senior High/ Vocation Education and above	27(21.3)	16(13.2)		
Occupation			0.377	**.539**
No	76(59.8)	77(63.6)		
Yes	51(40.2)	44(36.4)		
Smoking			0.084	**.772**
No	101(79.5)	98(81.0)		
Yes	26(20.5)	23(19.0)		
Drinking			0.755	**.385**
No	104(81.9)	104(86.0)		
Yes	23(18.1)	17(14.0)		
Betel Nut consumption			0.010	**.920**
No	119(93.7)	113(93.4)		

Yes	8(6.3)	8(6.6)		
History of urinary tract Infection			0.448	**.503**
No	89(70.1)	80(66.1)		
Yes	38(29.9)	41(33.9)		
BMI			0.268	**.605**
＜27	63(49.6)	64(52.9)		
≧27	64(50.4)	57(47.1)		
Blood Pressure			2.087	**.149**
Normal	22(17.3)	30(24.8)		
Abnormal	105(82.7)	91(75.2)		

Table 2: Attributes, physical examination data, health knowledge and behavior analysis of the experimental group and the control group (continued)

Variables	**N (%)/Mean±SD Experimental group (N＝127) N (%)/Mean±SD**	**N(%)/Mean±SD Control group (N＝121) N(%)/Mean±SD**	**χ^2 /t**	**P-Value**
Blood sugar			3.775	**.052**
Normal	28(22.0)	57(47.1)		
Abnormal	99(78.0)	64(52.9)		
Triglyceride			0.510	**.475**
Normal	72(56.7)	74(61.2)		
Abnormal	55(43.3)	47(38.8)		
Cholesterol			2.039	**.153**
Normal	92(72.4)	97(80.2)		
Abnormal	35(27.6)	24(19.8)		
LDL-Cholesterol			0.152	**.697**

Normal	96(75.6)	94(77.7)		
Abnormal	31(24.4)	27(22.3)		
Creatinine			0.000	**.982**
Normal	88(69.3)	84(69.4)		
Abnormal	39(30.7)	37(30.6)		
Glomerular filtration rate			0.388	**.824**
≧90	10(7.9)	9(7.5)		
60-89.9	41(32.3)	35(28.9)		
45-59.9	76(59.8)	77(63.6)		
Health knowledge			0.289	**.591**
Pass	87(68.5)	79(65.3)		
Fail	40(31.5)	42(34.7)		
Health behavior			1.858	**.173**
Good	76(59.8)	62(51.2)		
Bad	51(40.2)	59(48.8)		

Note: 1.Chi-square (χ^2) test is applied, significance level α=.05 (Two-tailed Test)

2. Independent-sample t test is applied, significance level α=.05 (Two-tailed Test)

Nine months after the individual health education intervention, a comparison analysis - using paired-sample t tests - of health knowledge and behavior scores between the experimental group and the control group was performed (Table 3). This analysis showed that, regardless of knowledge or behavior, both the pretest and posttest results, in both the experimental group and the control group, reached a statistical significance of $p < .001$, signifying that there was an improvement in health knowledge and behavior in both groups and an increase in both their scores. An analysis using independent-sample t tests showed that, for both health knowledge and behavior, there was a statistical significance in the posttest test results for both groups: 9.17 vs. 7.24 for the experimental group, and 12.95 vs. 11.36 for the control group. But the increase in scores was more significant for the experimental group.

Table 3: Comparison of health knowledge and behavior scores between both groups after the intervention of independent health education

Variables	Pretest Mean±SD	Posttest Mean±SD	Pretest and Posttest Mean±SD	t^a	p^a
Health knowledge					
Experimental group	6.54±2.33	9.17±2.52	2.62±1.46	**20.266**	**＜.001**
Control group	6.40±2.71	7.24±2.75	0.83±0.95	**9.648**	**＜.001**
t^b	**0.432**	**5.753**	**11.484**		
p^b	**.666**	**＜.001**	**＜.001**		
Health behavior					
Experimental group	11.55±1.84	12.95±2.69	1.40±1.65	**9.580**	**＜.001**
Control group	11.05±1.66	11.36±1.70	0.31±0.85	**4.079**	**＜.001**
t^b	**2.251**	**5.581**	**6.578**		
p^b	**.025**	**＜.001**	**＜.001**		

Note: t^a as the paired-sample t test, t^b as the independent-sample t test, significance level α=.05 (two-tailed test)

Analyzing the groupings and the effects on health knowledge and behavior before and after the intervention using the two-way mixed design ANOVA (Table 4), we found that differences in health knowledge and behavior occurred when the groupings were different (p<.001). The effects before and after the intervention indicated that both the health knowledge and behavior exhibited a difference for the different intervention period (p<.001). As there was interaction between health knowledge and behavior in terms of groupings and, since statistical significance was reached, verifications using the simple main effect test would have to be conducted (Table 5), and the results showed that:

1) Health knowledge: (1) in the factor A group, results were verified using the simple main effect test. Different groups did not reach statistical significance in their knowledge test values during the pretest period. But during the

posttest period, a statistical significance of $p < .001$ was reached in knowledge test values, with the average values being 3.17 vs. 7.24. (2) The verified results before and after factor B showed that the knowledge test values of different intervention periods for both the experimenting and control groups had reached a statistical significance of $p < .001$, with $p = .018$. A comparison of the average scores before and after the intervention shows that the experimental group recorded a score of 6.54 vs. 9.17, while the control group recorded 6.54 vs. 7.24.

2) Health behavior: (1) in the factor A group, results were verified using the simple main effects. The different groups reach a statistical significance of p=.025 in their behavior test values during the pretest period, with the average value being 11.55 vs. 11.05. During the posttest period, a statistical significance of $p < .001$ was reached in the behavior test values, with the average value being 12.95 vs. 11.36. (2) The verified results before and after factor B showed that the behavior test values for different intervention periods of the experimental group reached a statistical significance of $p < .001$, with the average score before and after the intervention recorded at 11.55 and 12.95, respectively. As for the control group, there was no statistical significance in the behavior value for the different intervention periods.

Table 4: Comparison of pretest and posttest health knowledge and behavior scores of both groups

Variance origin	*SS*	*df*	*MS*	*F*	*P*
Health knowledge					
Group effects	131.99	1	131.99	19.845	**＜.001**
Time effects	370.21	1	370.21	55.663	**＜.001**
Group and time interaction	98.97	1	98.97	14.881	**＜.001**
Health behavior					
Group effects	135.42	1	135.42	33.004	**＜.001**
Time effects	91.19	1	91.19	22.224	**＜.001**
Group and time interaction	36.64	1	36.64	8.930	**.003**

Note: two-way mixed design ANOVA is applied, significance level α=.05 (Two-tailed Test)

Table 5: Main Effects test on the pretest and posttest health knowledge and behavior scores of both groups

Variance origin	*SS*	*df*	*MS*	*F*	*P*
Health knowledge					
Group (Factor A)					
Pretest period	1.19	1	1.19	.186	**.666**
Posttest period	229.78	1	229.78	33.103	**＜.001**
Intervention period (Factor B)					
Experimental group	436.57	1	436.57	73.983	**＜.001**
Control group	42.15	1	42.15	5.667	**.018**
Health behavior					
Group (Factor A)					
Pre test period	15.59	1	15.59	5.065	**.025**
Post test period	156.48	1	156.48	30.509	**＜.001**
Intervention period (Factor B)					
Experimental group	124.74	1	124.74	23.474	**＜.001**
Control group	5.97	1	5.97	2.107	**.148**

Note: Simple main effect test of two-way ANOVA applied. Significance level α=.05 (two-tailed test)

Discussion

This study aims to investigate the effectiveness of independent health education intervention programs on improving health knowledge and behavior. The participants were divided into the experimental group and the control with the basic attributes and physical test data of both groups exhibiting no statistical significance. This meant that both study groups exhibited homogeneity, and a difference comparison between the two groups could be intensified.

In terms of health knowledge and behavior, after the experimental group of this study had undergone 3 sessions of the health education program, the scores they achieved in knowledge and behavior were significantly higher than

those of the control group. This effectively proves that this pioneering study in local CKD health education can provide health education proposals that would effectively improve disease awareness, attitude, and self-caring capabilities in CKD patients.[9] These results were also similar with those that were conducted by Hu, Lin, Zhang (2012), Wu et al. (2011), and Yen et al. (2008), which revealed that providing individual health education guidance and direct 1-to-1 interviews could serve as a complement to any uncertainties and clarify any misconceptions, thus triggering a motive for change.[10-12] Another study also demonstrated that providing diverse methods of health education during case management, and consultations between the patient and educator, could effectively improve the patient's level of disease awareness and health behavior, thus preventing or delaying the deterioration of kidney functions .[13]

For a comparison between the groups, as well as to show their differences in health knowledge and health behavior before and after the intervention, a two-way mixed ANOVA was applied, and the results indicated that both knowledge and behavior displayed significant differences. Differences were generated according to groupings and to the period before and after the intervention. An interaction existed between the verified results of knowledge and behavior. Verifications with simple main effects indicated that the average knowledge scores achieved by the post-health education experimental group during the posttest showed statistically significant improvement compared to that of the pretest group. The control group, which was only given health education brochures and booklets, also recorded a significant improvement in the posttest average knowledge scores when compared with those of the pretest, but the improvement was more significant in the experimental group. In terms of the increment of average knowledge scores, the comparison between the 2 groups was recorded as 2.62 vs. 0.83 (see Table 3), and the ratio of improved personnel at 96.1% vs. 60.6% (data not shown）. The average behavior score value achieved by the post-health education experimental group during the posttest showed statistically significant improvement over that of the pretest. This finding is consistent with that in previous study what was conducted by Bai, Zhang, Lai, Wang (2012), who emphasized providing an effective health education and strengthening the public's idea of prevention and cure to improve their knowledge, attitude and behavior.[14] This study aimed to expand upon the patient's relative knowledge of the disease and to improve self-caring capabilities through independent health education. A previous study conducted by Sperl-Hillen (2011) on type 2 diabetes patients showed that, after a tracking evaluation period of 1 year, the group that was subjected to independent health education had exhibited a significant improvement over the group that was subjected to group health education and regular healthcare in terms of blood sugar control, self effectiveness, disease awareness and behavior.[15]

Combining all of these studies, we can confirm that independent health education intervention measures improved the health and behavior of early stage CKD patients and that deterioration of their kidney functions could be delayed. Researchers pointed out that, since symptoms were not apparent during the early stages of kidney disease, if it could be diagnosed and treated early with independent health education guidance, the lifestyle of the patient could be adjusted so as to attenuate the course of the CKD.[16,17]

This study still had some limitations that are worth noting. Because the subjects were limited to the outpatients of a certain regional hospital in Southern Taiwan; a selection bias was probably inevitable, and so the study's findings cannot be generalized to all early stages of CKD patients. Additionally, due to limitations of manpower, time and funding, the time spent gathering cases lasted only 9 months, which was not sufficient for furthering the investigation into the improvement effectiveness of the intervention measures.

Conclusion

Nine months after the experimental group had been subjected to individual health education intervention, there were significant differences in the values of the experimental group's knowledge and behavior for different intervention periods. Comparing the average test values before and after the intervention, the average knowledge value was recorded at 6.54 vs. 9.17, and the average behavior value at 11.55 vs. 12.95. From these results we can see that the knowledge and behavior of the post-health education experimental group had a higher posttest value than the pretest value. For the control group, there were also significant differences in terms of knowledge test values during different intervention periods. The average value before and after the intervention was recorded at 6.40 vs. 7.24. But there was no statistical significance in terms of their behavior.

As it is important to control CKD over a long term basis, it is recommended that related studies in the future extend their timeframe for gathering cases, amend the health education content of intervention measures, and increase the number of clinical standard test items, so as to evaluate the improvement effectiveness of the healthcare program.

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