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The change of disease stage and clinical outcome of retardation of renal degeneration among patients living with the third and fourth stages of chronic kidney disease in the kidney degeneration clinic of secondary health services

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ABSTRACT

Introduction: The mortality rate from chronic kidney disease (CKD) at all ages has increased worldwide. It is possible to eliminate the progression of CKD, as it can be treated with early diagnosis and treatment.

Objectives: This research aims to study the changes in the stages of the disease and clinical outcomes in patients with the third and fourth stages of CKD.

Patients and Methods: This research is a retrospective analytic study in patients diagnosed with third- and fourth-stage of CKD at the Tha Chang Hospital, Thailand. The research sample consisted of 169 medical records of a small population with a confidence level of 0.95. Research data were collected between October 2019 and March 2021. Data analysis utilized frequency, percentage, paired *t* test, and Wilcoxon signed-rank test.

Results: The results revealed that after one year of attending the clinic, the average systolic blood pressure (SBP), diastolic blood pressure (DBP), triglyceride (TG), hemoglobin A1c (HbA1c), uric acid, high-density lipoprotein (HDL), estimated glomerular filtration rate (eGFR), and urine microalbumin had no differences. However, the average body mass index (BMI), total cholesterol (TC), low-density lipoprotein (LDL), and serum creatinine (sCr) showed statistically significant differences at $P < 0.05$. Most patients with CKD were in stable health conditions and disease stage (87.57%).

Conclusion: The third and fourth-stage CKD care model could be achieved by the multidisciplinary care team and requires a strategy that is sustainable in addition to continuous care by involving a family member and caregiver in the community.

Implication for health policy/practice/research/medical education:
Further research could integrate the community-based and multidisciplinary care model in order to improve the CKD patients' clinical outcome and quality of life.

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Introduction

Chronic kidney disease (CKD) is a major global issue, undergoing a 10% increase in the number of cases with each passing year. Between 1990 and 2017, there was a 74% increase in the number of CKD cases caused by type 2 diabetes worldwide. CKD prevalence was at 31.09%, with severity in the third stage being 27.14%. The factors associated with CKD are diabetes and hypertension (1,2). In 2017, CKD caused 1.2 million deaths and was the 12th leading cause of deaths worldwide. Between 1990 and 2017, the deaths caused by CKD amongst all ages worldwide increased by 41.5 percent, and the CKD mortality rates did not decrease (3,4). It is possible to prevent CKD, as it can be treated with early diagnosis and treatment (5).

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Thailand has been experiencing several CKD cases. A study by The Nephrology Society of Thailand revealed that 17.5% of Thai people suffer from CKD, or about 12 million people, and over 1000 patients in a population of a million require kidney replacement therapy. The number of treatments is also likely to increase every year (6). Hypertension, diabetes mellitus, and low-income are associated with the incidence of CKD (7). The Surat Thani province has a total population of 866 103, out of which CKD was found in 24 426 (2.82%) people. Of the total CKD patients, about 978 patients (4%) were diagnosed with end-stage kidney failure (8). There is a relatively high cost for each treatment, with an average kidney replacement therapy costing 1200 US$/person/year. This cost does not include medications and other indirect expenses, which also affect the patient's quality of life (9).

The Tha Chang hospital is a part of secondary health care; there were 607 cases of CKD out of a total population of 32 087. Out of the total patients, 1.89% were diagnosed with the abnormalities using laboratory tests with kidney filtration rates. There were 87 cases with the first-stage, 135 cases with the second stage, 315 cases with the third-stage, 65 cases with the fourth-stage, and 21 cases with the end-stage kidney disease (8). There are many CKD patients in the third and fourth stages compared to the other stages, whose quality of life are affected in several dimensions. Therefore, it is necessary to seek the current care as part of the different strategies for this patient group. In addition, the management and care for the third- and fourth-stage CKD patients are essential to inhibit the disease progression from reaching the end-stage for as long as possible. Therefore, the change of disease progression requires the assessment of the effectiveness of clinical routine care as an appropriate strategy for CKD patients.

Objectives

This research aims to study the changes in the stages of the disease and clinical outcomes in patients with third- and fourth-stage CKD.

Research Questions

What are the changes in the stages of the disease and clinical outcomes in patients with third- and fourth-stage CKD before and after one year of attending the kidney degeneration clinic?

Patients and Methods

Study design

This research is a retrospective analytic study on patients diagnosed with third- and fourth-stage CKD who attended the services at the kidney degeneration clinic, Tha Chang hospital, Surat Thani province. The population comprised 300 patients diagnosed with third- and fourth-stage CKD who attended the kidney degeneration clinic at the Tha Chang hospital in Surat Thani province between October 2019 and March 2021. The research sample consisted of 169 medical records of third- and fourth-stage CKD patients at the kidney degeneration clinic, Tha Chang hospital. Sampling recruitment was performed using a small population with a confidence level of 95% or 5% validity according to the Krejcie and Morgan Sampling table (10). A purposive sampling of medical records was conducted as per the following inclusion criteria:

1. The medical records of third- and fourth-stage CKD patients (both male and female) who attended the clinical treatment at the kidney degeneration clinic of Tha Chang hospital for at least one year were included.
2. The clinical outcomes, which are recorded as part of the laboratory's annual blood test results for all the CKD patients, were also considered, namely serum creatinine (sCr), estimated glomerular filtration rate (eGFR), body mass index (BMI), hemoglobin A1c (HbA1c), systolic blood pressure (SBP), diastolic blood pressure (DBP), total cholesterol (TC), low-density lipoprotein (LDL), high-density lipoprotein (HDL), triglyceride (TG), uric acid, and urine microalbumin.

Exclusion criteria include incomplete laboratory results both before and after a year in the kidney degeneration clinic.

Research instrument

The research instrument is divided into two parts; 1) Personal characteristics including gender, age, address and present illness. 2) The clinical outcome record both before and after attending the clinic.

Three experts reviewed the research instruments to obtain content validity by considering the item-objective congruence value between 0.6-1 ensuring the content validity reaches the standard value before collecting the data.

Data collection

The researcher contacted the director of Tha Chang hospital for cooperation with data collection and coordination with the kidney degeneration clinic. The next process involved informing the research purpose of the medical records officer for permission to access the patient data and select the medical records that meet the inclusion criteria to prepare for the next step of data collection. Finally, a review of the integrity and completeness of the data for analysis was conducted.

Data analysis

The researchers collected patient data and clinical outcomes from the hospital's HOSxP system. The data analysis was divided as follows;

1. Personal characteristics were analyzed using descriptive statistics that included percentage, average, and standard deviation.
2. Clinical outcomes were analyzed using inferential

statistics that included paired *t* test, and Wilcoxon signed-rank test.

The data were compared in terms of the average clinical outcomes before and after one year of entering the clinic. Data included the means of sCr, eGFR, BMI, HbA1c, SBP, DBP, TC, LDL, HDL, TG, uric acid and urine microalbumin, along with dependent *t* test statistics as statistical significance at 0.05 and tested statistical assumptions for samples of the dependent group pre-post measurement by the Kolmogorov-Smirnov method for BMI, DBP, uric acid, HDL, and eGFR. The result was a normal distribution with significance (2-tailed) values of 0.985, 0.594, 0.513, 0.061, and 0.879, respectively.

The average SBP, TC, LDL, TG, sCr, and HbA1c were not a normal distribution at significance (2-tailed) values of 0.016, 0.035, 0.010, 0.005, 0.001, and 0.001, respectively. Therefore, the Wilcox signed-rank test was used to further analyze the data.

Results

This study collected general information of third- and fourth-stage CKD patients including gender, age, and present diseases. According to Table 1, the majority of the samples were women (66.9%). Most participants were 61–80 years old (48.5%), followed by ≥81 years (46.5%). All participants had underlying diseases such as hypertension (97.6%) and diabetes (54.4%).

Table 1. The number and percentage of samples classified by gender, age, and underlying disease (N = 169)

Personal characteristics	No.	Percent
Gender		
Male	56	33.1
Female	113	66.9
Age (year)[a]		
≤60	11	6.5
61–80	81	47.9
≥81	77	45.6
Underlying disease		
Yes	169	100
Hypertension	165	97.6
Diabetes mellitus	92	54.4
Asthma/Chronic obstructive pulmonary disease	14	8.3
Others	26	15.4

[a] Mean = 77.39, Max = 96, Min = 40, SD = 10.00.

Comparative data for pre- and post-existing clinical outcomes at nephrology clinics were taken into account, as shown in Table 2. According to Table 2, after attending the kidney degeneration clinic, the average DBP, uric acid, HDL, and eGFR were no different. However, the average BMI, and TC when testing both variables were significantly different at $P<0.05$.

According to Table 3, the SBP, TG, HbA1c, and urine microalbumin results were tested with the Matching Wilcoxon signed-rank test. There were no statistical differences. However, the results of LDL, and sCr showed a statistically significant difference at $P<0.05$.

A change in the disease stage was observed after attending the kidney degeneration clinic, as shown in Table 4. According to Table 4, the results of the change in the stage of CKD were found significantly altered. Most patients, that is 148 cases, had a stable CKD stage (87.57%). Meanwhile, the number of patients with improved stages of the disease progression was 14 (8.28%). Finally, the number of negative progression in cases was seven (4.14%).

Discussion

The results revealed that most patients in this study were females aged 61-80 years old. Earlier evidence shows that kidney functions reduce by 1 mL/min/1.73 m^2/year for individuals over 30 years of age. The kidney's structure also changes with a one-percent decrease in blood supply to the kidneys. Moreover, kidney functions decrease by more than 50 percent for individuals over 65 years of age (11). The result also revealed that the average BMI, TC, LDL, and sCr decreased with a statistically significant difference at $P<0.05$ after the patients attended the kidney degeneration clinic. Therefore, the services can be effective in kidney degeneration and result in the eGFR decreasing compared to the target benchmark of the Ministry of Public Health, which is required to be less than 5 mL/min/1.73 m^2/year. Furthermore, the patients who attended the kidney degeneration clinic one year afterward had a

Table 2. The clinical outcomes before and after attending the kidney degeneration clinic

Clinical outcomes	Pre-Attendance (n=169) (Mean±SD)	Post-Attendance (n=169) (Mean±SD)	t-value	*P* value*
Body mass index (kg/m^2)	24.08±5.17	23.74±5.10	2.854	0.005*
Diastolic blood pressure (mm Hg)	68.58±10.24	68.69±11.73	-0.123	0.903
Uric acid (mg/dL)	6.52±1.56	6.61±1.75	-0.689	0.492
Triglyceride (mg/dL)	169.48±39.67	163.37±33.20	2.100	0.037*
High-density lipoprotein (mg/dL)	48.69±12.09	49.18±13.14	-0.624	0.534
Estimated glomerular filtration rate (mL/min/1.73 m^2)	43.53±9.79	42.77±10.98	1.414	0.159

*$P < 0.05$.

Table 3. The clinical outcome before and after treatment at the kidney degeneration clinic

Clinical outcomes	Samples (n=169)	Mean	SD	n	Wilcoxon value	Wilcoxon Prob
Systolic blood pressure (mm Hg)	Pre-attendance	132.28	12.81	169	-1.460	0.144
	Post-attendance	130.30	14.65	169		
Low-density lipoprotein (mg/dL)	Pre-attendance	97.02	41.89	169	-1.997	0.046*
	Post-attendance	91.08	37.47	169		
Triglyceride (mg/dL)	Pre-attendance	124.52	59.31	169	-1.211	0.226
	Post-attendance	124.52	59.31	169		
Serum creatinine (mg/dL)	Pre-attendance	1.37	0.39	169	-1.980	0.048*
	Post-attendance	1.39	0.41	169		
Hemoglobin A1c (%)	Pre-attendance	6.43	1.86	92	-0.235	0.814
	Post-attendance	6.52	1.91	92		
Urine microalbumin (mg/L)	Pre-attendance	393.19	1061.54	169	-1.949	0.051
	Post-attendance	342.07	749.71	169		

*$P < 0.05$.

constant stage of the disease (87.57%), which implies that the services could inhibit disease progression because of the care taken by a multidisciplinary team assuming a different role by focusing on patient contexts. In addition, professional nurses encourage health education relevance in terms of CKD to maintain favorable health conditions.

The physician considered the medical condition individually in order for the health concerns to be specific and appropriate for patients. Pharmacists are responsible for medication-related issues in terms of kidney degeneration. Physiotherapists promote proper exercise for CKD patients. Moreover, the clinic has integrated Thai traditional and herbal medicines that could both positively and negatively affect kidney function. More importantly, the clinic program pays attention to an appropriate diet for chronic kidney patients in every stage.

Table 4. The stage change in chronic kidney disease before and after one year attending the kidney degeneration clinic (n=169)

Stage disease progression	Frequency (case)	Percent
Positive progression		
3rd stage to 2nd stage	9	5.32
4th stage to 3rd stage	5	2.96
Total	14	8.28
Stable progression		
3rd stage to 3rd stage	136	80.47
4th stage to 4th stage	12	7.10
Total	148	87.57
Negative progression		
3rd stage to 4th stage	7	4.14
4th stage to 5th stage	0	0
Total	7	4.14
Total	**169**	**100**

The nutritionist promotes health literacy and awareness regarding nutrition (12). As a result, patients with third- and fourth-stage CKD gain the essential knowledge of the potential risks involved from a multidisciplinary team. In addition to this finding, there were continuous follow-up treatments, including clinical effects related to increased kidney filtration rates and reduced creatinine serum before and after being treated in the clinic. This is similar to a recent study which showed care by a multidisciplinary team improved a CKD patient's clinical outcome (13,14). However, some studies suggest that further research is required to determine the best strategy for a multidisciplinary CKD care model (15). In addition, recent studies have indicated that the nutrition control care model modifies CKD patient behaviors in terms of dietary habits to achieve a positive therapeutic outcome (16,17).

This study revealed a positive clinical outcome through TC and LDL toward the multidisciplinary care model, similar to the recent study that studied the effects of integrated care on delaying the progression of stage 3-4 CKD (18). However, unlike the previous study, the result of the BMI control was effective in this study. This may be due to the continuous care program by a multidisciplinary team and the focus on nutrition control and healthy self-care behaviors. On the other hand, the current model of care has not focused on monitoring behavior inside homes or in the community. Therefore, it is less likely to modify such patients' behavior and health outcomes wherein the result of BP, uric acid, HDL-c, TG, HbA1c, and urine microalbumin did not have a statistically significant difference between before and after entering the clinic. In addition, the urine microalbumin result was a high average that means an increase in the functioning of glomerular permeability. It commonly occurs in older people with underlying diseases such as diabetes or

hypertension (4). Both factors exist in this study as most of the samples were aged 60 and older, and they were both diabetes and hypertension underlying diseases. Therefore, developing the third and fourth stage CKD care model is essential to control the blood pressure level to suit the patient's requirement. Designing the appropriate care model requires focusing on a strategy that reduces the amount of protein leakage in the urine and controls the HbA1c, HDL-c, and TG levels by comprehensive care towards patient lifestyle and in terms of their local and traditional lives.

Conclusion

This article presents the data on clinical outcomes between before and after one year of attending the kidney degeneration clinic and has revealed that third- and fourth-stage CKD patients mostly exhibit stable stage of disease progression after one year. However, some patients experienced negative progressions and health conditions. The results represent the trends in health management for CKD patients, and these findings indicate the critical need of developing an appropriate health care system within the context of health status among patients with CKD.

Limitations of the study

This study has a few limitations such as focusing on the specific data in only one area of secondary health services. Various areas of the province may be taken into account to generalize the result of care. This research also studies short-term change as a one-year progression, therefore the next study could investigate a long-term clinical outcome.

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Authors' contribution

Conceptualization: Pirat Puaksawat, Praditporn Pongtriang.
Data curation: Pirat Puaksawat.
Formal analysis: Pirat Puaksawat, Praditporn Pongtriang.
Funding acquisition: Pirat Puaksawat.
Investigation: Pirat Puaksawat, Praditporn Pongtriang.
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Visualization: Praditporn Pongtriang.
Writing–original draft: Praditporn Pongtriang.
Writing–review & editing: Praditporn Pongtriang, Pirat Puaksawat.

Conflicts of interest

The authors declare no conflict of interest.

Ethics issues

The research followed the principles of the Declaration of Helsinki and was considered by the Human Research Ethics committee, Surat Thani Provincial Public Health Office (STPHO2021-015). The researchers uphold the rights and privacy of all participants throughout the research process. Information collected from medical records is kept confidential, with participant names replaced by codes to ensure de-identification. The treatment, information, and clinical outcomes are presented in the overall results, so the same could not be linked to the patient. All documents are stored in a secure room with a lock, and they will be destroyed after five years of completion of the project. Prior to any intervention, all participants provided written informed consent. Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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References

1. Horowitz B, Miskulin D, Zager P. Epidemiology of hypertension in CKD. Adv Chronic Kidney Dis. 2015;22:88-95. doi: 10.1053/j.ackd.2014.09.004.
2. Abd ElHafeez S, Bolignano D, D'Arrigo G, Dounousi E, Tripepi G, Zoccali C. Prevalence and burden of chronic kidney disease among the general population and high-risk groups in Africa: a systematic review. BMJ Open. 2018;8:e015069. doi: 10.1136/bmjopen-2016-015069.
3. Carney EF. The impact of chronic kidney disease on global health. Nat Rev Nephrol. 2020;16:251. doi: 10.1038/s41581-020-0268-7.
4. Mallappallil M, Friedman EA, Delano BG, McFarlane SI, Salifu MO. Chronic kidney disease in the elderly: evaluation and management. Clin Pract (Lond). 2014;11:525-35. doi: 10.2217/cpr.14.46.
5. Qian Q. Inflammation: a key contributor to the genesis and progression of chronic kidney disease. Contrib Nephrol. 2017;191:72-83. doi: 10.1159/000479257.
6. Kanjanabuch T, Takkavatakarn K. Global dialysis perspective: Thailand. Kidney360. 2020;1:671-75. doi: 10.34067/kid.0000762020.
7. Ku E, Lee BJ, Wei J, Weir MR. Hypertension in CKD: core curriculum 2019. Am J Kidney Dis. 2019;74:120-31. doi: 10.1053/j.ajkd.2018.12.044.
8. STPHO. Health data center. 2019. Available from: https://sni.hdc.moph.go.th/hdc/main/index.php. Accessed October 13, 2021.
9. Treerutkuarkul A. Thailand: health care for all, at a price. Bull World Health Organ. 2010;88:84-5. doi: 10.2471/blt.10.010210.
10. Krejcie RV, Morgan DW. Determining sample size for research activities. Educ Psychol Meas. 1970;30:607-10. doi: 10.1177/001316447003000308.
11. Denic A, Glassock RJ, Rule AD. Structural and functional changes with the aging kidney. Adv Chronic Kidney Dis. 2016;23:19-28. doi: 10.1053/j.ackd.2015.08.004.
12. Taylor DM, Fraser S, Dudley C, Oniscu GC, Tomson C,

Ravanan R, et al. Health literacy and patient outcomes in chronic kidney disease: a systematic review. Nephrol Dial Transplant. 2018;33:1545-58. doi: 10.1093/ndt/gfx293.
13. Johns TS, Yee J, Smith-Jules T, Campbell RC, Bauer C. Interdisciplinary care clinics in chronic kidney disease. BMC Nephrol. 2015;16:161. doi: 10.1186/s12882-015-0158-6.
14. Chen YR, Yang Y, Wang SC, Chou WY, Chiu PF, Lin CY, et al. Multidisciplinary care improves clinical outcome and reduces medical costs for pre-end-stage renal disease in Taiwan. Nephrology (Carlton). 2014;19:699-707. doi: 10.1111/nep.12316.
15. Collister D, Pyne L, Cunningham J, Donald M, Molnar A, Beaulieu M, et al. Multidisciplinary chronic kidney disease clinic practices: a scoping review. Can J Kidney Health Dis. 2019;6:2054358119882667. doi: 10.1177/2054358119882667.
16. Wai SN, Kelly JT, Johnson DW, Campbell KL. Dietary patterns and clinical outcomes in chronic kidney disease: the CKD.QLD nutrition study. J Ren Nutr. 2017;27:175-82. doi: 10.1053/j.jrn.2016.10.005.
17. Cupisti A, Brunori G, Di Iorio BR, D'Alessandro C, Pasticci F, Cosola C, et al. Nutritional treatment of advanced CKD: twenty consensus statements. J Nephrol. 2018;31:457-73. doi: 10.1007/s40620-018-0497-z.
18. Jiamjariyapon T, Ingsathit A, Pongpirul K, Vipattawat K, Kanchanakorn S, Saetie A, et al. Effectiveness of integrated care on delaying progression of stage 3-4 chronic kidney disease in rural communities of Thailand (ESCORT study): a cluster randomized controlled trial. BMC Nephrol. 2017;18:83. doi: 10.1186/s12882-016-0414-4.