International Journal of Gerontology 14 (2020) 174–178
https://doi.org/10.6890/IJGE.202008_14(3).0005

International Journal of Gerontology

journal homepage: http://www.sgecm.org.tw/ijge/

Original Article

Association between Marital Status and Chronic Kidney Disease among Middle-Aged and Elderly Taiwanese: A Community-Based, Cross-Sectional Study

I-Ju Chen [a], Yah-Hsuan Chuang [a], Le-Tien Hsu [b], Jau-Yuan Chen [a,c] *

[a] *Department of Family Medicine, Chang Gung Memorial Hospital Linkou Main Branch, Taoyuan, Taiwan,* [b] *Department of Gynecology and Obstetrics, Chang Gung Memorial Hospital Linkou Main Branch, Taoyuan, Taiwan,* [c] *College of Medicine, Chang Gung University, Taoyuan, Taiwan*

ARTICLE INFO

Accepted 25 November 2019

Keywords:
chronic kidney disease,
community study,
marital status,
elderly,
risk factors

SUMMARY

Background: The main aim of this study was to explore whether the risk of chronic kidney disease (CKD) varies by marital status among men and women aged 50 years and older in Taiwan.
Methods: The study data were gathered from health exams in communities of northern Taiwan from January to October 2014. In this study, people who were divorced, separated, widowed, or never married were categorized as currently single. Those who lived with their mate regardless of married or not were categorized as currently couple. We used chi-square test and a multiple logistic regression model to evaluate the association between CKD and different marital status. Other factors for CKD, including sex, age, smoking, body mass index (BMI), systolic blood pressure (SBP), heart rate, fasting plasma glucose (FPG), triglyceride (TG), uric acid, occupation, and source of income were adjusted.
Results: A total of 400 participants were enrolled in this study (35.3% male and 64.8% female), with a mean age of 64.47 ± 8.45 years. Among them, 19% (n = 76) were categorized as currently single. The prevalence of CKD was higher in single status (31.58%) than in couple status (17.59%) (p value = 0.01). Multiple logistic regression analysis indicated an independent association of marital status and CKD (odds ratio [OR] = 2.14, 95% confidence interval [CI]: 1.12–4.09, p = 0.02) after adjusting for other confounding factors.
Conclusions: Marital status is associated with CKD in middle-aged and elderly Taiwanese population. Single status is an independent risk factor for CKD.

1. Introduction

Chronic kidney disease (CKD) is a severe condition that may reduce life expectancy and progress to end-stage renal disease (ESRD) with a need for renal replacement therapy. The prevalence of CKD is 10.5% to 13.1% in the general population and up to 25% to 35% in the elderly over 65 years of age around the world.[1] A large Taiwanese cohort study showed that the prevalence of CKD was 11.9% in adults and 37.2% among the elderly.[2] The prevalence of ESRD in Taiwan was higher than in many other countries.[3] According to the Bureau of National Health Insurance (BNHI) annual report, ESRD patients in Taiwan accounted for 0.23% of the local population but cost 7.2% of the health-care resources.[4] In most cases, CKD evolved from known renal or systemic diseases, but in some cases, the pathogenesis remains unknown. Many risk factors were associated with CKD development or progression, such as hyperglycemia, hypertension, dyslipidemia, proteinuria, smoking, old age, heavy consumption of nonnarcotic analgesics, and certain environmental and occupational exposures.[5–10] In addition to these traditional risk factors, low socio-economic status (SES) is also found to be associated with an increased risk of CKD.[2,11]

Marital status is a significant risk factor for cardiovascular disease (CVD), coronary heart disease (CHD), and total mortality.[12–14] Yet, the evidence regarding the association between marital status and CKD is still scant. One study has shown that an unhappy marriage and increased marital conflict may have serious consequences for the health in ESRD patients, including death.[15] To explore whether the risk of CKD varies by marital status, we investigated the relationship between marital status and CKD among the community-dwelling middle-aged and elderly population in Taiwan.

2. Materials and methods

2.1. Study design and participants

A community based, cross-sectional study was conducted at Linkou Chang Gung Memorial Hospital in Taoyuan City, Taiwan between January and October 2014. We enrolled 400 volunteer participants, including 141 men and 259 women. The inclusion criteria included: (1) residents 50 years of age or older, and (2) residents living in Guishan District. Participants were excluded if they (1) could not complete all examinations or unable to communicate to complete an interview; (2) were functionally dependent; (3) had major illnesses recently. In addition, a sample size of 352 achieves 90% power using two tail(s), odds ratio = 2.0, probability of null hy-

* Corresponding author.
E-mail address: welins@cgmh.org.tw (J.-Y. Chen)

pothesis = 0.15, alpha error = 0.05, power = 0.9 and R^2 for other confounding factors = 0.5.[16] A total of 400 subjects comprised the sample size of this study, which implied the sufficient statistical power. The study was approved by the Institutional Review Board of Chang Gung Memorial Hospital, and the written informed consent was obtained from all of the participants before enrollment.

2.2. Data collection

Data collection comprised three parts: anthropometric measurements, laboratory tests and structured questionnaires. For the anthropometric measurements, body mass index (BMI), blood pressure (BP), and heart rate were recorded. BMI was calculated as weight (kg) divided by height squared (m^2). Systolic blood pressure (SBP), diastolic blood pressure (DBP) and heart rate were checked at least twice after 5 minutes of rest on a chair. Laboratory tests included blood and urine sampling, fasting plasma glucose (FPG), serum total cholesterol (TC), high-density lipo-protein-cholesterol (HDL-C), serum triglycerides (TG), uric acid and urine albumin to creatinine ratio (ACR). Venous blood samples were collected after overnight fasting for at least 12 hours. Urine specimens were obtained in the morning and scheduled to avoid menstrual periods. Personal history was collected by a standard interview, and the information of structured questionnaires included marital status, education years, religious beliefs, smoking/drinking habits, sleep condition, occupation, and source of income. Education years were divided into two group, $\leq$ 6 years or > 6 years. The categories used for occupation are the following, regardless of retired or not: unemployed, agriculture, forestry, fishing, and animal husbandry occupations, manufacturing occupations, government employee, service industry and business occupations, and others. Source of income was divided into two groups, oneself or others.

2.3. Definition of CKD and marital status

CKD is defined as decreased renal function with an estimated glomerular filtration rate (eGFR) < 60 mL/min/1.73 m^2 or the presence of albuminuria (urine ACR > 30 mg/g).[17] The eGFR was calculated using modified equations of Modification of Diet in Renal Disease (MDRD) for Chinese CKD patients: $175 \times (\text{Creatinine})^{-1.234} \times (\text{Age})^{-0.179} \times 0.79$ (for females).[18] The stage of CKD is defined by the level of GFR, with higher stages representing lower GFR levels, according to the Kidney Disease Improving Global Outcomes (KDIGO) revised classification: (1) stage 1 (eGFR $\geq$ 90 mL/min per 1.73 m^2 with kidney damage); (2) stage 2 (eGFR 60 to 89 mL/min per 1.73 m^2 with kidney damage); (3) stage 3 (eGFR 30 to 59 mL/min per 1.73 m^2); (4) stage 4 (eGFR 15 to 29 mL/min per 1.73 m^2); (5) stage 5 (eGFR < 15 mL/min per 1.73 m^2 or treatment by dialysis).[19] Kidney damage in many kidney diseases can be ascertained by the presence of albuminuria, defined as albumin-to-creatinine ratio (ACR) > 30 mg/g.[17]

Marital status was divided into two groups: (1) currently single (divorced, separated, widowed, and never married); (2) currently couple (living with their mate regardless of married or not). The current marital status was defined according to the present marital status of the participants during the interview.

2.4. Statistical analysis

The sample size determination was based on the G*power 3.1 software. Clinical characteristics were expressed as the mean $\pm$ standard deviation (SD) for continuous variables and number (%) for categorical variables. p-values were derived from independent Student's t-test for continuous variables and chi-square test for categorical variables. Multiple logistic regression models were developed to investigate the independence of marital status associated with CKD. All statistical analyses were performed using Statistical Product and Service Solutions (SPSS) for Windows, SPSS version 20.0 (SPSS Inc., Chicago, IL). A probability value of less than 0.05 was considered to be significant.

3. Results

Data from 400 participants aged 50 years or older (mean age: 64.47 $\pm$ 8.45 years, 35.3% males) were enrolled into this study. The general characteristics of the study population were divided into the CKD group and the non-CKD group as shown in Table 1. Of the total participants, 81 (20.3%) had CKD and 76 (19%) were categorized as currently single. The mean eGFR of the total participants was 112.97 $\pm$ 33.43 ml/min/1.73 m^2, while the mean eGFR was 117.21 $\pm$ 27.82 ml/min/1.73 m^2 in the non-CKD group and 96.25 $\pm$ 33.43 ml/min/1.73 m^2 in the CKD group ($p < 0.001$). Of the total 81 participants in the CKD group, 43 were in stage 1 CKD, 16 in stage 2 CKD, 17 in stage 3 CKD, 2 in stage 4 CKD, and 3 were in stage 5 CKD. Furthermore, the percentage of participants being currently single in the non-CKD group and CKD group were 16.3% and 29.6% ($p = 0.01$), suggesting that the CKD group has a higher prevalence of currently single status than the non-CKD group. Age, SBP/DBP, FPG levels and TG levels were also significantly higher in the CKD group. However, there was no significant difference between two groups, based on education years, occupation, and source of income.

Multiple logistic regression model results are shown in Table 2. Model 1 assessed the crude OR of CKD by marital status; Model 2 adjusted for sex, age, smoking habits and BMI; Model 3 adjusted for sex, age, smoking habits, BMI, occupation, source of income, and other factors that may be associated with renal function, including SBP, heart rate, FPG, TG, and uric acid. After adjusting for the above-mentioned confounding factors, marital status (currently single versus currently couple, OR = 2.14, 95% CI: 1.12–4.09) was still significantly associated with CKD (Table 2-model 3). In addition, adjusted SBP (OR = 1.02, 95% CI: 1.00–1.04), FPG (OR = 1.01, 95% CI: 1.00–1.02) and uric acid (OR = 1.32, 95% CI: 1.07–1.63) were also significantly associated with CKD (Table 2-model 3).

Figure 1 shows that the prevalence of CKD was 31.58% in the single group and 17.59% in the couple group ($p = 0.01$ [chi-square test]), suggesting that the prevalence of CKD is higher in single status than in couple status.

4. Discussion

In our study, single individuals were associated with increased CKD prevalence, compared with coupled individuals in the middle-aged and elderly population in Taiwan. To the best of our knowledge, this is the first evidence synthesis that uses cross-sectional study to quantify the evidence base to evaluate the relationship between marital status and CKD.

4.1. Interpretation of findings

We have known about the adverse outcomes of marital status in several ways. First, a meta-analysis of 53 studies revealed higher all-cause mortality in never married, divorced, and widowed individuals than married individuals.[13] A recent meta-analysis of 34

Table 1
General characteristics of the study population according to CKD and non-CKD.

Variables	Chronic kidney disease			
	Total (n = 400)	Yes (n = 81)	No (n = 319)	p value
Age (year)	64.47 ± 8.45	66.67 ± 9.71	63.91 ± 8.02	0.02
SBP (mmHg)	129.50 ± 16.71	135.38 ± 16.51	128.01 ± 16.46	< 0.001
DBP (mmHg)	76.93 ± 11.36	79.99 ± 13.42	76.15 ± 10.66	0.01
Heart rate (/min)	76.08 ± 11.45	78.04 ± 11.03	75.53 ± 10.95	0.12
BMI (kg/m^2)	24.55 ± 3.57	25.10 ± 3.93	24.41 ± 3.46	0.12
Creatinine (mg/dL)	0.78 ± 0.43	1.06 ± 0.83	0.70 ± 0.17	< 0.001
eGFR (ml/min/1.73 m^2)	112.97 ± 33.43	96.25 ± 46.29	117.21 ± 27.82	< 0.001
FPG (mg/dL)	96.23 ± 25.73	105.31 ± 40.20	93.93 ± 19.95	0.02
HDL-C (mg/dL)	54.43 ± 13.93	51.04 ± 15.16	55.29 ± 13.49	0.01
Total Cholesterol (mg/dL)	197.15 ± 35.71	190.72 ± 34.94	198.78 ± 35.77	0.07
TG (mg/dL)	122.07 ± 65.97	145.95 ± 87.39	116.01 ± 57.94	0.004
TG/HDL-C	2.55 ± 1.96	3.37 ± 2.72	2.35 ± 1.66	0.002
Uric acid (mg/dL)	5.75 ± 1.41	5.55 ± 1.50	5.60 ± 1.25	0.79
Marital status, n(%)				0.01
Currently single	76 (19.0)	24 (29.6)	52 (16.3)	
Currently couple	324 (81.0)	57 (70.4)	267 (83.7)	
Sex, n (%)				0.52
Men	141 (35.3)	31 (38.3)	110 (34.5)	
Women	259 (64.8)	50 (61.7)	209 (65.5)	
Education years, n(%)				0.60
≤ 6	208 (52.0)	40 (49.4)	168 (52.7)	
> 6	192 (48.0)	41 (50.6)	151 (47.3)	
Religious beliefs, n (%)				0.13
Yes	376 (94.0)	79 (97.5)	297 (93.1)	
No	24 (6.0)	2 (2.5)	22 (6.9)	
Alcohol drinking, n (%)				0.01
High (≥ 2 times/week)	75 (18.8)	7 (8.6)	68 (21.3)	
Low (< 2 times/week)	325 (81.3)	74 (91.4)	251 (78.7)	
Current smoking, n (%)				0.78
Yes	43 (10.8)	8 (9.9)	35 (11.0)	
No	357 (89.3)	73 (90.1)	284 (89.0)	
Sleep disturbance, n (%)				0.06
Yes	129 (32.3)	19 (23.5)	110 (34.5)	
No	271 (67.8)	62 (76.5)	209 (65.5)	
Sleep duration, n (%)				0.52
≥ 6 hr	288 (72.0)	56 (69.1)	232 (72.7)	
< 6 hr	112 (28.0)	25 (30.9)	87 (27.3)	
ACR, n (%)				< 0.001
> 30 mg/g	75 (18.8)	75 (92.6)	0 (0.0)	
≤ 30 mg/g	325 (81.3)	6 (7.4)	319 (100.0)	
Occupation, n (%)				0.50
Unemployed	65 (16.3)	14 (17.3)	51 (16.0)	
Agriculture, forestry, fishing and animal husbandry	32 (8.0)	9 (11.1)	23 (7.2)	
Manufacturing	88 (22.0)	12 (14.8)	76 (23.8)	
Government employee	30 (7.50)	5 (6.2)	25 (7.8)	
Service industry and business	116 (29.0)	26 (32.1)	90 (28.2)	
Others	69 (17.3)	15 (18.5)	54 (16.9)	
Source of income, n (%)				0.78
Oneself	192 (48.0)	40 (49.4)	152 (47.6)	
Others	208 (52.0)	41 (50.6)	167 (52.4)	

Notes: Clinical characteristics are expressed as mean ± SD for continuous variables and n (%) for categorical variables. p-value were derived from independent Student's t-test for continuous variables and chi-square test for categorical variables.
Abbreviations: SBP, systolic blood pressure; DBP, diastolic blood pressure; BMI, body mass index; eGFR, estimated glomerular filtration rate; FPG, fasting plasma glucose; HDL-C, high-density lipoprotein cholesterol; TG, triglyceride; ACR, albumin to creatinine ratio.

studies demonstrated that compared with married participants, unmarried participants (never married, divorced or widowed) were associated with increased odds of CVD (OR = 1.42; 95% CI: 1.00–2.01), CHD (OR = 1.16; 95% CI: 1.04–1.28), CHD death (OR = 1.43; 95% CI: 1.28–1.60) and stroke death (OR = 1.55; 95% CI: 1.16–2.08).[14]

Much research has observed the protective effect of social support on patients in several ways including renal function. For married population, a primary source of social support could be their spouse or significant other acting as a caregiver or confidant. If greater social support is associated with improved depression, compliance, and survival, then married individuals should have improved health status compared with unmarried individuals. According to a paper discussing about roles of health literacy, acculturation, and social support in CKD progression in Hispanics, it suggested that lower levels of health literacy and acculturation were associated with differences in knowledge, attitudes, and behaviors which may contribute to CKD progression, and higher levels of social support may ameliorate the

Table 2
Multiple logistic regression analyses on marital status and CKD.

Variables	Odds ratio	95% CI	p value
Model 1			
Marital status (currently single versus couple)	2.16	1.23–3.79	0.01
Model 2			
Marital status (currently single versus couple)	1.96	1.07–3.59	0.03
Sex (men versus women)	1.23	0.70–2.16	0.48
Age (years)	1.03	1.00–1.06	0.05
Smoke (yes versus no)	0.86	0.36–2.06	0.74
BMI (kg/m^2)	1.06	0.99–1.13	0.11
Model 3			
Marital status (currently single versus currently couple)	2.14	1.12–4.09	0.02
Sex (men versus women)	1.03	0.51–2.08	0.94
Age (years)	1.03	0.99–1.06	0.16
Smoke (yes versus no)	0.58	0.22–1.55	0.28
BMI (kg/m^2)	0.99	0.91–1.07	0.72
SBP (mmHg)	1.02	1.00–1.04	0.02
Heart rate (/min)	1.02	0.99–1.04	0.14
FPG (mg/dL)	1.01	1.00–1.02	0.03
Triglyceride (mg/dL)	1.00	1.00–1.01	0.21
Uric acid (mg/dL)	1.32	1.07–1.63	0.01
Occupation			
Agriculture, forestry, fishing and animal husbandry versus unemployed	1.03	0.33–3.20	0.97
Manufacturing versus unemployed	0.57	0.22–1.45	0.24
Government employee versus unemployed	0.67	0.19–2.43	0.55
Service industry and business versus unemployed	1.00	0.43–2.31	1.00
Others versus unemployed	0.70	0.27–1.84	0.47
Source of income			
Others versus oneself	0.79	0.43–1.44	0.44

Abbreviations: BMI, body mass index; SBP, systolic blood pressure; FPG, fasting plasma glucose; CKD, chronic kidney disease; CI, confidence interval.

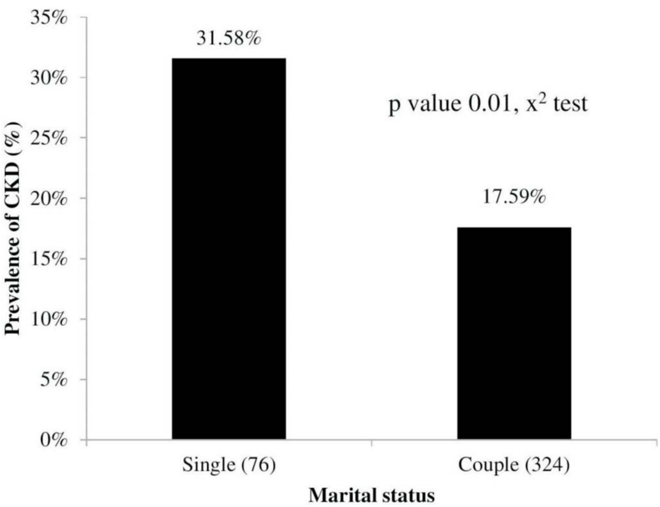

Figure 1. Prevalence of CKD among different marital status.

effects of low health literacy and acculturation on CKD progression.[20] Therefore, social support may also be a factor to predict the progression of CKD. A randomized trial revealed that the odds of major depression increased with increasing socioeconomic disadvantages, reaching a maximum OR of 1.84 (95% CI: 1.35–2.52) for people in the most disadvantaged quintile, suggesting higher prevalence of depression among socioeconomically disadvantaged individuals.[21] Another meta-analysis of 148 studies showed a 50% increased likelihood of survival for participants with stronger social relationships (OR = 1.50; 95% CI: 1.42–1.59).[22]

Although the SBP, FPG and TG levels were higher in the CKD group in our study, marital status was still significantly associated with CKD after adjusting these factors with known or suspected impacts on renal function. Other than traditional risk factors of CKD, three studies from different countries and ethnicities have shown that low SES has been disclosed to be associated with an increased risk of CKD or ESRD.[2,11,23] In Sweden, Fored et al. compared 926 CKD patients with 998 control subjects, and found that compared with women in families with the highest SES, female members of unskilled families had a 110% (OR = 2.1; 95% CI: 1.1–4.0) excess risk for CKD following adjustments for confounding factors; the corresponding excess among men was 60% (OR = 1.6; 95% CI: 1.0–2.6); subjects with 9 years or less of schooling had a 30% (OR = 1.3; 95% CI: 1.0–1.7) higher risk compared with those who went to university.[11] In the United States, Young et al. used the United States Renal Data System (USRDS) and Bureau of Health Professions Area Resource File (ARF) database to explore whether the incidence of treated ESRD (t-ESRD) was associated with differences in socioeconomic status, and found that for both whites and blacks, t-ESRD incidence was associated with income independently of the model covariates (age, sex, urban fraction, and geographic region) with an inverse relationship.[23] In Taiwan, a prospective cohort study enrolled 462,293 individuals with 13 years of follow-up and demonstrated that the prevalence of CKD was higher in the low SES group than in the high SES group (19.87% vs. 7.33%), and so was the prevalence of CKD associated all-cause mortality.[2] Our data about the participant's SES included the individual's education years, occupation, and source of income, but there were no significant differences between the CKD group and non-CKD group, based on these factors. Our study was a community-based study in one district, so selection bias might be existed.

Furthermore, a study in Finland has found that SES was inversely related to the risk of divorce risk. The study enrolled 766,637 marriages, followed up for 3 years, and the results have shown that (1) the divorce risk decreases as the educational levels increase; (2) manual workers have higher divorce risks than white-collar employees.[24] Therefore, we can infer that the divorced population is more likely to have lower SES and higher risk of CKD or ESRD than the married population, which are similar to our findings.

4.2. Limitations

Our findings are based on data originating from a community-based cross-sectional study, and this limits our ability to infer a causal relationship between marital status and CKD. We are also unable to dismiss the possibility of reverse causality (i.e., CKD influencing marital status). In addition, participants were enrolled from a community in northern Taiwan, which raises uncertainty of the external validity of the findings and the possible healthy volunteer bias. The results of this study should not be extrapolated to other regions of Taiwan, and future studies using random sampling of communities over a wider range of regions would make the research more discursive. The possible healthy volunteer bias would have led to a lower prevalence of CKD and would have decreased our ability to adjust final results for confounding. Although the eGFR levels between the CKD group and the non-CKD group were significantly different, the mean eGFR in the CKD group was 96.25 ± 46.29 ml/min/1.73 m^2, representing CKD stage 1–3, which is in normally to moderately renal function reduction[17] and may be a healthy volunteer bias. Furthermore, the results may be confounded by unmeasured factors, such as heavy consumption of nonnarcotic analgesics, certain environmental or occupational exposures, and nephrotoxic herbal use, which may be common in middle-aged and elderly group in Taiwan. Although single status is an independent risk factor for CKD found by our study, if one is single but lives with other family members, or is taken care by foreign caregivers, that would be the protective effects to one's health. On the other hand, if one's spouse is functionally dependent and they live together, it would be the disadvantages to one's health for taking care of his or her spouse. Therefore, other confounding factors including functionally dependent spouses, other family members and foreign caregivers would be taken into consideration in the further research.

In conclusion, our analysis supports that marital status is significantly associated with CKD, and being single is an important independent risk factor for CKD in the middle-aged and elderly population in Taiwan. People who were divorced, separated, widowed, or never married might be a potential risk factor for renal function impairment. Having a life companion may have protective effects on CKD development according to our findings.

Acknowledgements

This study was supported by Chang Gung Memorial Hospital (grants CORPG3C0171~3C0172, CZRPG3C0053, CORPG3G0021, CORPG3G0022).

Disclosure statement

The authors declare that they have no conflict of interests.

References

1. James MT, Hemmelgarn BR, Tonelli M. Early recognition and prevention of chronic kidney disease. *Lancet.* 2010;375:1296–1309.
2. Wen CP, Cheng TY, Tsai MK, et al. All-cause mortality attributable to chronic kidney disease: A prospective cohort study based on 462 293 adults in Taiwan. *Lancet.* 2008;371:2173–2182.
3. Wu PC, Wu VC, Tarng DC. Chronic kidney disease in Taiwan's aging population: Something far more than a distant ship's smoke on the horizon. *J Formos Med Assoc*. 2014;113:890–891.
4. Shi Y, Xiong J, Chen Y, et al. The effectiveness of multidisciplinary care models for patients with chronic kidney disease: A systematic review and meta-analysis. *Int Urol Nephrol.* 2018;50:301–312.
5. Tsuruya K, Yoshida H, Nagata M, et al. Association of hypertriglyceridemia with the incidence and progression of chronic kidney disease and modification of the association by daily alcohol consumption. *J Ren Nutr.* 2017;27:381–394.
6. Said S, Hernandez GT. Environmental exposures, socioeconomics, disparities, and the kidneys. *Adv Chronic Kidney Dis.* 2015;22:39–45.
7. Orth SR. Smoking and the kidney. *J Am Soc Nephrol.* 2002;13:1663–1672.
8. Klag MJ, Whelton PK, Randall BL, et al. Blood pressure and end-stage renal disease in men. *N Engl J Med.* 1996;334:13–18.
9. Jafar TH, Stark PC, Schmid CH, et al. Progression of chronic kidney disease: The role of blood pressure control, proteinuria, and angiotensin-converting enzyme inhibition: A patient-level meta-analysis. *Ann Intern Med.* 2003;139:244–252.
10. Fored CM, Ejerblad E, Lindblad P, et al. Acetaminophen, aspirin, and chronic renal failure. *N Engl J Med.* 2001;345:1801–1808.
11. Fored CM, Ejerblad E, Fryzek JP, et al. Socio-economic status and chronic renal failure: A population-based case-control study in Sweden. *Nephrol Dial Transplant.* 2003;18:82–88.
12. Eaker ED, Sullivan LM, Kelly-Hayes M, et al. Marital status, marital strain, and risk of coronary heart disease or total mortality: The Framingham Offspring Study. *Psychosom Med.* 2007;69:509–513.
13. Manzoli L, Villari P, M Pirone G, et al. Marital status and mortality in the elderly: A systematic review and meta-analysis. *Soc Sci Med.* 2007; 64:77–94.
14. Wong CW, Kwok CS, Narain A, et al. Marital status and risk of cardiovascular diseases: A systematic review and meta-analysis. *Heart.* 2018; 104:1937–1948.
15. Cohen SD, Sharma T, Acquaviva K, et al. Social support and chronic kidney disease: An update. *Adv Chronic Kidney Dis.* 2007;14:335–344.
16. Jacob C. *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. New Jersey, USA: Lawrence Erlbaum Associates; 1988.
17. Levey AS, Eckardt KU, Tsukamoto Y, et al. Definition and classification of chronic kidney disease: A position statement from Kidney Disease: Improving Global Outcomes (KDIGO). *Kidney Int.* 2005;67:2089–2100.
18. Ma YC, Zuo L, Chen JH, et al. Modified glomerular filtration rate estimating equation for Chinese patients with chronic kidney disease. *J Am Soc Nephrol.* 2006;17:2937–2944.
19. KDIGO CKD Work Group. KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. *Kidney International Supplements.* 2013;3:1–150.
20. Lora CM, Gordon EJ, Sharp LK, et al. Progression of CKD in Hispanics: Potential roles of health literacy, acculturation, and social support. *Am J Kidney Dis.* 2011;58:282–290.
21. Almeida OP, Pirkis J, Kerse N, et al. Socioeconomic disadvantage increases risk of prevalent and persistent depression in later life. *J Affect Disord.* 2012;138:322–331.
22. Holt-Lunstad J, Smith TB, Layton JB. Social relationships and mortality risk: A meta-analytic review. *PLoS Med.* 2010;7:e1000316.
23. Young EW, Mauger EA, Jiang KH, et al. Socioeconomic status and end-stage renal disease in the United States. *Kidney Int.* 1994;45:907–911.
24. Jalovaara M. Divorce by family composition and socioeconomic status in finnish first marriages. *Finn Yearb Popul Res.* 2000;36:63–88.