A Causal Model of Successful Aging Among Older Adults with Kidney Function Decline

Nada Ngammoh[1], *Aporn Deenan[1], Waree Kangchai[1]

[1]Faculty of Nursing, Burapha University, Chonburi, Thailand

*Correspondence
Dr. Aporn Deenan
Faculty of Nursing, Burapha University, Chonburi, Thailand
E-mail: apornd@hotmail.com

ABSTRACT

Background/Purpose: This study explored psychosocial and health-related variables that influence successful aging among older adults with kidney function decline.

Methods: Using a cross-sectional design that recruited 350 participants from two outpatient clinics by simple random sampling. Participants completed a set of health and psychosocial measures. Structural equation modeling was used to test a model.

Results: The final model of successful aging consisted of optimism, resilience, perception of health status, and self-transcendence. The model explained 84% of the total variance. Optimism, resilience, perception of health status, and self-transcendence influenced both direct effects and indirect effects on successful aging. Additionally, self-transcendence was found to be a moderator between optimism, resilience, perception of health status, and successful aging.

Conclusion: The results provide the context of understanding the significant predictors for successful aging in older people with kidney function decline. Interventions that increase the interplay of predictors are needed to assist this population.

1. INTRODUCTION

Older adults are increasingly focused on aging successfully and how to maintain quality of life and happiness. As adults age, however, more social and healthcare services are needed in supporting them to live independently, securely, with dignity, and high quality of life.[1] Successful aging is one strategy that emphasizes health promotion and adaptation for older adults.[2] As a positive aging experience, successful aging helps older adults to maintain their quality of life and general happiness. They learn coping and adaptation skills to remain physically, psychologically, socially, and spiritually healthy. With successful aging, older adults develop effective skills to manage their chronic diseases and illnesses, expand their spirituality, enjoy a strong sense of meaning in life, gain greater life satisfaction, confront the prospect of death, and prepare for a peaceful death.[2-4]

The concept of successful aging was introduced by Rowe and Kahn,[5] who launched a new direction to advance high cognitive and physical functional capacity and active engagement with life for older

adults. Initially, Rowe and Kahn[5] focused on avoiding disease and disability among older people. Their ideas sought to lower the probability of disease and disease-related disability and decrease or delay morbidity and mortality among older adults. While striving towards a positive theoretical orientation of aging, the framework implies that to be diagnosed with a chronic condition is no longer to age well.[6]

Flood[4] offers an augmented view of successful aging that highlights the overlapping and intertwining nature of physical, functional, psychological, and spiritual health as people age.[4] This perspective contradicts the idea that people with one or more chronic conditions should automatically be excluded from achieving successful aging. Even in the face of functional decline, older adults can experience successful aging if they adapt psychosocially.[7] Their self-perception and self-evaluation of physical and physiological changes during the aging process can evolve over time. From this perspective, successful aging emphasizes adaptation and is achievable for a broader range of adults than what other theoretical models present.[8]

With its emphasis on adaptation, successful aging involves older adults' subjective perspectives about disability. Common forms of disability in older adults often center around difficulties with walking, hearing, and seeing. Despite their disabilities, many older adults are satisfied with life.[9] For example, older adults in one study who had at least two impairments in activities of daily living and instrumental activities of daily living still felt they were aging successfully.[10] They achieved successful aging by using adaptation and coping strategies.

Successful aging can coexist with chronic health conditions that bring functional limitations.[7] For example, the chronicity of osteoarthritis among older people does not prevent achieving successful aging.[11] Neither does diabetes. One strategy used by a group of older adults with diabetes was comparing themselves with the illnesses of friends and family; this motivated their social engagement and care for others and brought a sense of well-being.[12] The following three adaptation and coping strategies to manage the ongoing functional decline in older adults with chronic obstructive pulmonary disease have been suggested: selection, optimization, and compensation.[13] Although there is evidence of successful aging in the older population who have chronic diseases or disabilities, successful aging has not been explored from the perspective of older people living with kidney function decline (KFD).

Currently, most health reports indicate that many older adults tend to develop KFD as they are growing old. It is estimated that after the age of 30 years, the glomerular filtration rate (GFR) progressively declines at an average rate of 8 mL/min/1.73 m^2/ decade.[14] KFD often develops slowly with few symptoms, and many people do not realize its occurrence until the disease has advanced. About half of the population over 70 years old has an estimated GFR <60 mL/min/1.73 m^2.[15] Older age is a key predictor of KFD, and 11% of individuals over 65 years have creatinine levels that fall in stage 3 or worse.[15,16] This is considered a significant age-related decline in kidney function.[16]

With little evidence support for successful aging and KFD, it may question about older adults with KFD could achieve successful aging. The literature review indicates that KFD impacts older adults on physical, psychological, emotional, spiritual, economic, and social aspects. In addition, the biochemical changes in older adults with KFD can manifest as what is called the frailty phenotype, which is a poor reserve and inadequate response to stressors.[17] Frail people are more likely to have poor physical and cognitive function and less ability to complete daily activities.[18] Older adults with KFD have ineffective management of disease and illness, insufficient coping abilities, and maladaptation to health care, and dissatisfaction with life. These could negatively affect their quality of life.[19] Furthermore, older adults face KFD stressors that may affect their poor emotional states of anxiety and depression, thus inhibiting their ability to cope and adjust.[20,21] Depression is the most significant psychological disorder among older adults and people with KFD[21] and has been found in 26.5% of this population. The presence of depression complicates treatment and increases the risk of developing new illnesses and death.[21] When KFD progressively worsens, older people often experience loneliness, hopelessness, and spiritual distress.

From the literature review, research has identified that eight variables are independently associated with successful aging: estimated Glomerular filtration rate (eGFR) decline, older adult's age,[22,23] perception of health status,[24] self-efficacy,[25,26] depression,[27] resilience,[28,29] optimism,[30,31] and self-transcendence.[32,33] However, researchers rarely examined the simultaneously relationships among these variables on successful aging. Moreover, previous studies have not specifically explored all predictors' direct or indirect effects on successful aging among older adults with KFD. Therefore, the purpose of this study was to examine the causal relationships among important selected variables and successful aging. The results of this study would help health care providers to promote successful aging in older adults with KFD.

2. METHODS

2.1 Study Participants, Sampling, and Setting

This study was a descriptive, model testing design. The study's target population was older adults with chronic kidney disease from an outpatient department at a tertiary hospital in the eastern of Thailand. This hospital was selected because of the high percentage of patients with chronic kidney disease. Inclusion criteria for eligible participant were aged ≥60 years; eGFR between 15-60mL/min/1.73 m^2 for at least three months; no cognitive impairment as determined by the Mini-Cog;[34] ability to communicate in the Thai language; and absence of symptoms that could interfere with the person's ability to respond to questions, such as tiredness, dizziness, nausea, or vomiting.

The sample size was estimated based on parameters of the hypothesized model, 10-15 participants per parameter.[35] There were 21 parameters in this study, then the minimum sample size of 315 would be needed. A total of 350 participants was recruited for possible missing data. A simple random sampling technique was used to recruit the sample. The sampling technique started in the early morning; the researcher checked the health records of 15-30 patients with KFD who registered for daily follow-up. Participants who met the inclusion criteria were invited to the study. Simple random of 7-12 eligible participants per day (assigned number for eligible participants was drawn from the box) was completed. Each participant was screened for possible cognitive impairment using the Mini-Cog.

2.2. Measures

The demographic questionnaire was used to collect a participant's gender, age, education level, marital status, average monthly income, experiences with a life crisis in the past two years, eGFR, and comorbid conditions.

Successful aging was measured using the 20-item Successful Aging Inventory (SAI) developed by Troutman et al.[36] SAI has four dimensions: functional performance mechanism, intrapsychic factors, spirituality, and gerotranscendence. Participants rate each item on a five-point Likert scale with choices ranging from 0 "strongly disagree" to 4 "strongly agree." Higher scores indicate higher successful aging. SAI was translated into Thai by the primary investigator using the back-translation method after the instrument's owner granted permission. Cronbach's alpha in this study was 0.89.

Self-transcendence was measured using the 15-item Self-Transcendence Scale (STS) developed by Reed.[37] The unidimensional STS consists of 15 items on a four-point response scale which measures older adults' perceptions of the degree or level of transcendence, ranging from 1 for "not at all" to 4 for "very much." The STS uses mean scores, with higher scores

designating greater self-transcendence. Cronbach's alpha in this study was 0.87.

Self-efficacy to control KFD was measured using the CKD Self-Efficacy (CKD-SE) questionnaire developed by Lin et al.[38] to measure an individual's perception of their self-efficacy of control KFD. It has 25 items with four subscales: autonomy, self-integration, problem-solving, and seeking social support. The response options ranged from no confidence (0) to the highest degree of confidence (10). The possible summed scores can range from 0 to 250 points, with higher scores indicating greater levels of self-efficacy. It was translated into the Thai version by Photharos et al.[39] Cronbach's alpha in this study was 0.90.

Perception of health status was measured using the international (Thai) version of the Health Survey Short Form-12 version 2 (SF-12v2) to assess functional health and well-being from an individual's point of view, characterizing physical and mental-emotional well-being. It contains 12 items derived from the original Health Survey SF-36.[40] Participants respond on a five-point rating scale. Total scores can range from 12 to 56 with higher scores indicating a higher level of perceived health status. Cronbach's alpha in this study was 0.88.

Resilience was measured using the Connor-Davidson Resilience Scale -10 Items (CD-RISC-10) developed by Connor and Davidson[41] in English and translated into Thai by Imlimtharn.[41] The 25-item scale was revised to a 10-item scale that reflects a person's ability to tolerate experiences, such as change, personal problems, illness, pressure, failure, and painful feelings. Respondents rate items on a five-point rating scale, rating from 0 for "not true at all" to 4 "true nearly all the time." A higher score indicates higher resilience. Cronbach's alpha in this study was 0.92.

Depression was measured using the Geriatric Depression Scale-15 (GDS-15) developed by Shiekh and Yesavage[42] in English. The owner modified this short version from the original 30 items, and the previous study showed that it was reliable and easier to use in older people. It is a 15-item self-rated scale measuring depression in older people.[42] Respondents will answer "Yes" or "No" on each item. The GDS-15 was translated into Thai by Wongpakaran and Wongpakaran[43] and administered to 130 older people in the community with the internal consistency of 0.85 and good construct validity. The summed scores range from 0 to 15. A higher score indicates more depressive symptoms. A cut-off of six scores was used as the threshold to discriminate individuals with and without depressive symptoms. The reliability in this study was 0.80.

Optimism was measured using the Life Orientation Test-Revised (LOT-R) developed by Scheier et al.[44]

and translated into Thai by Lonhlam. The LOT-R is a unidimensional self-report scale consisting of 10-items, only items #1, 3, 4, 7, 9, and 10 are used in scoring. Items #2, 5, 6, and 8 are "filler" items and not scored. Respondents rated on a five-point Likert rating scale, from 0 "I disagree a lot" to 4 "I agree a lot." A higher score indicates increased optimism. Cronbach's alpha in this study was 0.82.

2.3. Data Collection Process

Data collection took place from October 2019 to January 2020. The primary investigator and research assistants met older adults with KFD during their visits to the hospital's outpatient clinics. After being introduced by staff nurses, the primary investigator invited the older adults to participate in the study and explained the objective of the study. Questions from the prospective participants were clarified prior to obtaining consent. The process took about 45-60 minutes. For participants who could not read, the questions were read to them. After completing the interview, measurement instruments were checked for possible missing items. If participants chose not to respond to any item, data collection ended.

2.4. Data Analysis

Descriptive statistics were used to assess the participants' characteristics and measured variables. To assesses the relationships among study variables and direct and indirect pathways predicting successful aging, we used SEM with confirmatory factor analysis to verify the construct validity of each latent factor. SEM with a maximum likelihood estimation method was used to evaluate the fit of the hypothesized model based on the following multiple criteria: Model Chi-square value (CMIN/df ≤2), Goodness of Fit Index (GFI ≥0.90), Adjusted Goodness of Fit Index (AGFI ≥0.90), Normed Fit Index (NFI ≥0.90), Comparative Fit Index (CFI ≥0.95), and Root Mean Square Error of Approximation (RMSEA <0.05).[45,46]

3. RESULTS

The participants' ages ranged from 60 to 103 years old, averaging 74.7 years old. The majority were married (51.7%) and female (58.9%). More than half (60.8%) had completed elementary education and a majority (51.7%) were married. Less than half (42%) of the participants indicated their income was insufficient, yet 31.4% reported they had sufficient income and could save money. The overwhelming majority (99.7%) of older adults with KFD had experienced a life crisis or trauma within the prior two years, mostly related to their own illness. Over two-thirds (68.9%) of the older adults were in stage 3 of their chronic kidney disease with comorbidities of hypertension (84.3%), diabetes mellitus (79.1%), and dyslipidemia (48.6%). Table 1 displays the participants'

ages, eGFR decline, and measurement scores.

Multivariate outliers were tested by Mahalanobis' distance. A probability value of the chi-square statistic <0.001 is considered an outlier.[45,46] The results showed that there were four outliers; therefore, four cases were eliminated. Finally, a sample of 346 participants was included in data analysis and still met sample size suggestion.[46] Pearson's product-moment correlation coefficients between each pair of variables did not exceed 0.90; the tolerance values ranged from 0.28 to 0.87; the variance inflation factors values ranged from 1.15 to 3.57,[45,46] indicating there was no multicollinearity.

3.1. Model Testing Results

Data analysis by AMOS found that the hypothesized model did not fit the data well (CMIN=2704.22, df=1279, p <0.001, CMIN/df=2.11, GFI=0.76, AGFI =0.73, NFI=0.76, CFI=0.86, and RMSEA=0.06; see Figure 1). Then, model modification by trimming non-significant parameters were used to improve model fit. Six parameters were deleted from the model based on significant statistics suggestion. In the process of modification, the researcher still retained the paths from resilience to successful aging and the

**Table 1.** Age of participants and their scores on measurement variables (n=350)

Variables	Possible Range	Actual Range	M	SD
Participant's age	60-103	60-103	74.7	7.79
eGFR decline	15-60	15-60	41.4	13.96
Perception of health status	12-56	25-55	44.7	6.92
Optimism	0-24	9-24	18.8	3.73
Depression	0-15	0-8	2.6	1.48
Resilience	0-40	18-40	33.9	5.71
Self-efficacy to control KFD	0-250	117-250	192.8	28.88
Self-transcendence	15-60	30-60	50.1	6.68
Successful aging	0-80	37-80	63.9	9.86

Figure 1. Hypothesized model of successful aging in older adults with KFD

Note: * p < .05, ** p < .01, *** p < .001
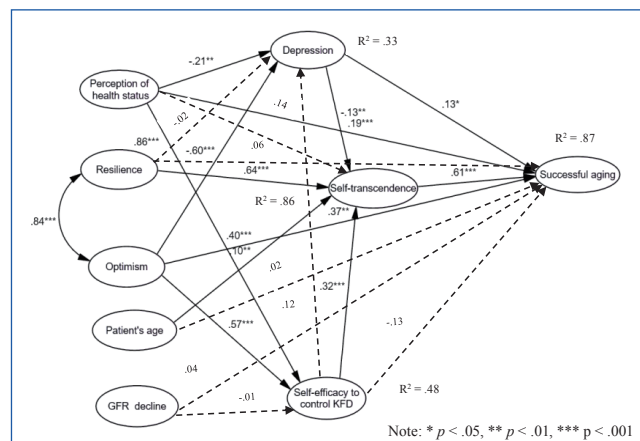
perception of health status to self-transcendence of hypothesized model, even though they were not statistically significant because they were substantial evidences of the construct of successful aging. Finally, the best model showed goodness-of-fit indices (CMIN=738.50, *df*=725, *p*=0.36, CMIN/*df*=1.02, GFI=0.91, AGFI=0.89, NFI=0.92, CFI=1.00, and RMSEA=0.01; see Figure 2).

Figure 2. The final model of successful aging in older adults with KFD
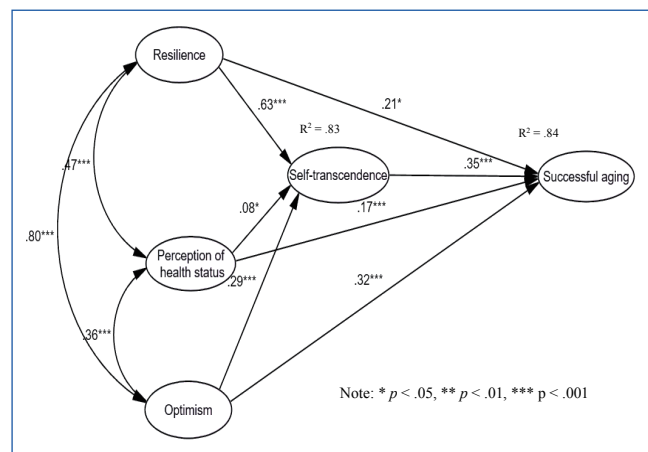
The final model showed that four significant variables had positive direct effects on successful aging including self-transcendence (β=0.35, *p* <0.001), optimism (β=0.32, *p* <0.001), resilience (β=0.21, p <0.05), and perception of health status (β=0.17, p <0.001). Furthermore, there were three significant variables had positive indirect effects on successful aging including resilience through self-transcendence (β=0.22, *p* <0.001), optimism through self-transcendence (β=0.10, *p* <0.001), and perception of health status through self-transcendence (β=0.03, *p* <0.001). The total variance explained 84%.

4. DISCUSSION

The results provide the context of understanding the important predictors of successful aging in older people with KFD. This study found that people with KFD had a moderate level of successful aging, and psychosocial and health-related variables could predict successful aging. The results would benefit health care providers to promote older people with KFD to perform activities of daily living independently. The older adults reported high scores on their perception of health status, probably because they felt healthy and found it easy to cope with the changes to their bodies at this point, even with their comorbidities. The result was supported by previous studies that successful aging was found at a moderate level among other older adults with comorbidities, such as in those with hypertension, vision impairment, arthritis, diabetes, and chronic pain.[31,47] Thus, it could be confirmed that successful aging was presented in patients with functional decline or chronic disease.[11,13,30]

Resilience is a pattern of adaptation in the face of biological, socioeconomic, and psychological risks, found that resilience positively predicted successful aging in older adults with KFD. As adults age, they may have learned over time how to use this psychological mechanism to exhibit a compensatory response-ability to cope, adapt to change, and deal with problems, handle unpleasant feelings, and not feel discouraged when confronted with stressful life events. Resilience helps people overcome adversity and return to normal levels during stressful situations. Resilience has been linked with successful aging in other studies.[48,49] Strategies to increase resilience may be effective in increasing successful aging when older people have physical.[28] Even with physical limitations and structural obstacles, older adults can learn to age successfully.

Optimism had a positive effect on successful aging. Optimism is a general attitude to facilitate positive reactions to situations that arise in life. If older adults have optimism, it will be easier to accept various situations, especially health problems. They will tackle problems and find solutions to get positive outcomes. This study found that optimism directly predicts successful aging in older adults with KFD. Other studies have reported that optimism in older adults with a chronic illness or functional decline positively affects their ability to age successfully.[50] Older adults age more successfully when they focus on a positive state of mind, express a positive outlook on life, or find positive ways of relating to others.[8,30,31] Optimism is integral in the transition from poor health to better-perceived health.[50]

Higher levels of perceived health status had a positive direct effect on successful aging. Having a good perception of one's health status typically makes people feel more comfortable coping with bodily changes that occur with aging.[4] A good perception of health is necessary for older adults to reduce the risk of mortality and disability. Most older adults at stage 3 of KFD might see their health condition as of minor consequence. Thus, with a higher perception of good health, older adults with KFD may be more receptive to strategies to control and manage themselves with health promotion activities, dietary adherence, and other preventive health practices as KFD progresses. Perceived health status is not only related to successful aging[24,25] but is also one factor in understanding how people manage their illness and achieve positive behavioral outcomes.

Self-transcendence predicted successful aging in older adults with KFD. A person's sense of self-transcendence includes a psycho-social-spiritual force toward personal maturity. It enhances an individual's searching for new meaning, perspectives, and well-being, allowing them to overcome ego concerns. Self-transcendence enhances well-being by transforming

failures and problems into healing experiences.[37] Indeed, older adults with a strong sense of self-transcendence will find it easier to accept emotionally difficult situations, such as illness in themselves or a loved one, loss of loved ones, disability, aging process, and other life crises. A high level of self-transcendence creates joy for older adults in their pace of life, hobbies, interest in helping others, learning about the world, and sharing wisdom. It helps them to arrive at successful aging more easily. Self-transcendence is associated with a higher quality of life and a lower degree of distress.[32,33,37] It has been described as a vital resource for well-being in vulnerable older adults and has a clear, positive direct effect on successful aging.[32,33]

5. CONCLUSION

The study provides useful insight to understand successful aging in the context of older adults with KFD. The study's findings showed that older adults with KFD reported a moderate level of successful aging. Resilience has the most substantial influence over successful aging, although self-transcendence moderates between resilience, optimism, perception of health status, and successful aging.

Nurses and health care providers could use these factors influencing successful aging to develop interventions to promote successful aging based on optimism, self-transcendence, resilience, and positive perception of health status. The results of this study could be used in clinical practice, such as screening successful aging and its predicting factors to promote independent living among older adults with KFD. However, with the limitation of generalization because of study only one setting, the future study may need to widely study in multiple sites and across the country as well as in older adults with the varied stage of chronic kidney disease.

Ethical Consideration

Data collection started after ethical approval was granted by the institutional review boards at a university in eastern Thailand and a nearby tertiary care hospital (IRB# 04-08-2562 and 042/2562). All older adults were informed of the study objectives and provided written informed consent. The participants were informed that their participation in the study was voluntary, with no identification, and destroy data after finishing.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

Acknowledgments

REFERENCES

1. Prutipinyo C. Review of law and policy toward health care management for senior citizen. *J Public Health and Laws.* 2015;**1**(2):149-63.

2. Topaz M, Troutman-Jordan M, MacKenzie M. Construction, deconstruction, and reconstruction: the roots of successful aging theories. *Nurs Sci Quart.* 2014;**27**(3):226-33.

3. Hutchinson SL, Nimrod G. Leisure as a resource for successful aging by older adults with chronic health conditions. *Int J Aging Hum Dev.* 2012;**74**(1):41-65.

4. Flood M. A mid-range nursing theory of successful aging. *JTCT.* 2005;**9**(2):35-9.

5. Rowe JW, Kahn RL. Successful aging. *Gerontologist.* 1997;**37**(4):433-40.

6. Cosco TD, Prina AM, Perales J, Stephan BC, Brayne C. Operational definitions of successful aging: a systematic review. *Int Psychogeriatr.* 2014;**26**(3):373-81.

7. Young Y, Frick KD, Phelan EA. Can successful aging and chronic illness coexist in the same individual? A multidimensional concept of successful aging. *J Am Med Dir Assoc.* 2009;**10**(2):87-92.

8. Troutman-Jordan M, Staples J. Successful aging from the viewpoint of older adults. *Res Theor Nurs Pract.* 2014;**28**(1):87-104.

9. Liu Jr JL, Richardson PK. Successful aging in older adults with disability. *OTJR.* 2012;**32**(4):126-34.

10. Romo RD, Wallhagen MI, Yourman L, Yeung CC, Eng C, Micco G, et al. Perceptions of successful aging among diverse elders with late-life disability. *Gerontologist.* 2013;**53**(6):939-49.

11. Marks R. Successful aging and chronic osteoarthritis. *Medicines.* 2018;**5**(3):105-18.

12. Chard S, Harris-Wallace B, Roth EG, Girling LM, Rubinstein R, Reese AM, et al. Successful aging among African American older adults with type 2 diabetes. *J Gerontol B Psychol Sci Soc Sci.* 2016;**72**(2):319-27.

13. Southwell PJ, Crockett J, Burton D, Gullifer J. Successful ageing with COPD: physicaland psychosocial adaption to functional decline. *Int J Chron Obstruct Pulmon Dis.* 2018;**15**(5):439-45.

14. Coresh J, Astor BC, Greene T, Eknoyan G, Levey AS. Prevalence of chronic kidney disease and decreased kidney function in the adult US population: third national health and nutrition examination survey. *Am J Kidney Dis.* 2003;**41**(1):1-12.

15. Aitken GR, Roderick PJ, Fraser S, Mindell JS, O'Donoghue D, Day J, et al. Change in prevalence of chronic kidney disease in England over time: comparison of nationally representative cross-sectional surveys from 2003 to 2010. *BMJ.* 2014;**4**(9):1-12.

16. Levey AS, Inker LA, Coresh J. Chronic kidney disease in older people. *JAMA.* 2015;**314**(6):557-8.

17. Walker SR, Wagner M, Tangri N. Chronic kidney disease, frailty, and unsuccessful aging: a review. *J Ren Nutr.* 2014;**24**(6):364-70.

18. Bowling CB, Sawyer P, Campbell RC, Ahmed A, Allman RM. Impact of chronic kidney disease on activities of daily living in community-dwelling older adults. *J Gerontol A Biol Sci Med Sci.* 2011;**66**(6):689-94.

19. Soni RK, Weisbord SD, Unruh ML. Health-related quality of life outcomes in chronic kidney disease. *Curr Opin Nephrol Hypertens.* 2010;**19**(2):153-9.

20. Ok E, Kutlu FY. Hopelessness, anxiety, depression and

treatment adherence in chronic hemodialysis patients. *Int J Caring Sci.* 2019;**12**(1):423-9.

21. Palmer S, Vecchio M, Craig JC, Tonelli M, Johnson DW, Nicolucci A, et al. Prevalence of depression in chronic kidney disease: systematic review and meta-analysis of observational studies. *Kidney Int.* 2013;**84**(1):179-91.

22. Depp CA, Jeste DV. Definitions and predictors of successful aging: a comprehensive review of larger quantitative studies. *Am J Geriatr Psychiatry.* 2006;**14**(1):6-20.

23. Hank K. How successful do older Europeans age? Findings from SHARE. *J Gerontol B Psychol Sci Soc Sci.* 2011;**66**(2):230-6.

24. Thi Thu Trieu N, Jullamate P, Piphatvanitcha N. Factors related to successful aging among older adults in Da Nang, Vietnam. *J Nurs Health Sci.* 2016;**10**(3):38-44.

25. Kim EJ. Accessing factor structure and construct validity of the successful aging inventory. *J Korean Acad Nurs.* 2013;**43**(4):568-78.

26. Tovel H, Carmel S. Maintaining successful aging: the role of coping patterns and resources. *J Happiness Stud.* 2014;**15**(2):255-70.

27. Troutman M, Nies MA, Bentley M. Measuring successful aging in southern black older adults. *Educ Gerontol.* 2010;**37**(1):38-50.

28. Jeste DV, Savla GN, Thompson WK, Vahia IV, Glorioso DK, Martin AvS, et al. Association between older age and more successful aging: critical role of resilience and depression. *Am J Psychiatry.* 2013;**170**(2):188-96.

29. Lamond AJ, Depp CA, Allison M, Langer R, Reichstadt J, Moore DJ, et al. Measurementand predictors of resilience among community-dwelling older women. *J Psychiatr Res.* 2008;**43**(2):148-54.

30. Solomon P, Letts L, O'Brien KK, Nixon S, Baxter L, Gervais N. 'I'm still here, I'm still alive': understanding successful aging in the context of HIV. *Int J STD AIDS.* 2018;**29**(2):172-7.

31. Troutman M, Nies MA, Mavellia H. Perceptions of successful aging in black older adults. *J Psychosoc Nurs Ment Health Serv.* 2011;**49**(1):28-34.

32. McCarthy VL. A new look at successful aging: exploring a mid-range nursing theory among older adults in a low-income retirement community. *JTCT.* 2011;**15**(1):17-23.

33. McCarthy VL, Ling J, Carini RM. The role of self-transcendence: a missing variable in the pursuit of successful aging? *Res Gerontol Nurs.* 2013;**6**(3):178-86.

34. Borson S, Scanlan J, Brush M, Vitaliano P, Dokmak A. The mini-cog: a cognitive vital signs measure for dementia screening in multi-lingual elderly. *Int J Geriatr Psychiatry.* 2000;**15**(11):1021-7.

35. Raykov T, Widaman KF. Issues in applied structural equation modeling research. *J Multidiscip Res.* 1995;**2**(4):289-318.

36. Troutman M, Nies MA, Small S, Bates A. The development and testing of an instrument to measure successful aging. *Res Gerontol Nurs.* 2011;**4**(3):221-32.

37. Reed PG. Self-transcendence in aging scale: mental health of older adults. *West J Nurs Res.* 1989;**11**(2):161-3.

38. Lin CC, Wu CC, Anderson RM, Chang CS, Chang SC, Hwang SJ, et al. The chronic kidney disease self-efficacy (CKD-SE) instrument: development and psychometric evaluation. *Nephrol Dial Transplant.* 2012;**27**(10):3828-34.

39. Photharos N, Wacharasin C, Duongpaeng S. Model of self-management behavior in people experiencing early stage chronic kidney disease. *Pac Rim Int J Nurs Res.* 2018;**22**(4):360-71.

40. Ware Jr JE, Kosinski M, Keller SD. A 12-item short-form health survey: construction of scales and preliminary tests of reliability and validity. *Med Care.* 1996;**34**(3):220-33.

41. Connor KM, Davidson JR. Development of a new resilience scale: the Connor-Davidson resilience scale (CD-RISC). *Depress Anxiety.* 2003;**18**(2):76-82.

42. Sheikh JI, Yesavage JA. Geriatric depression scale (GDS): recent evidence and development of a shorter version. *Clin Gerontol: J Aging Ment Health.* 1986;**5**(1-2):165-73.

43. Wongpakaran N, Wongpakaran T. Prevalence of major depressive disorders and suicide in long-term care facilities: a report from northern Thailand. *Psychogeriatr.* 2012;**12**(1):11-7.

44. Scheier MF, Carver CS, Bridges MW. Distinguishing optimism from neuroticism (and trait anxiety, self-mastery, and self-esteem): a reevaluation of the life orientation test. *J Pers Soc Psychol.* 1994;**67**(6):1063-78.

45. Hair Jr JF, Black WC, Babin BJ, Anderson RE. *Multivariate Data Analysis.* London: Pearson Education Limited; 2014.

46. Kline RB. *Principles and Practice of Structural Equation Modeling.* New York: Guilford Press; 2016.

47. Howie LO, Troutman-Jordan M, Newman AM. Social support and successful aging in assisted living residents. *Educ Gerontol.* 2014;**40**(1):61-70.

48. Kozar-Westman M, Troutman-Jordan M, Nies MA. Successful aging among assisted living community older adults. *J Nurs Scholarsh.* 2013;**45**(3):238-46.

49. Byun J, Jung D. The influence of daily stress and resilience on successful ageing. *Int Nurs Rev.* 2016;**63**(3):482-9.

50. Umami UR. Optimism as a mediation between self-acceptance and successful aging for elderly. *ASSEHR.* 2019;**304**:118-21.