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ORIGINAL RESEARCH

Socio-Demographic and Clinical Profiles Associated with Sodium Consumption Behaviors in Patients with Non-Dialysis Chronic Kidney Disease: A Study in Myanmar

Kay Thi Hlaing[1], Aurawamon Sriyuktasuth[2], Warunee Phligbua[2]

[1]*Master of Nursing Science Program (International Program), Faculty of Nursing, Mahidol University, Bangkok, Thailand*
[2]*Department of Medical Nursing, Faculty of Nursing, Mahidol University, Bangkok, Thailand*

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Corresponding Author:
Aurawamon Sriyuktasuth
Department of Medical Nursing, Faculty of Nursing, Mahidol University, Bangkok, Thailand
Email:
aurawamon.sri@mahidol.ac.th

Abstract

Background: Sodium consumption behaviors (SCB) play a significant role in the development of kidney failure and associated comorbidities in patients with chronic kidney disease (CKD). Despite the widespread harmful effects of excessive salt consumption, factors influencing SCB in patients with non-dialysis CKD are still little known in Myanmar. No previous study was carried out among Myanmar populations with non-dialysis CKD.
Purpose: This study aimed to identify the association between socio-demographic and clinical profiles and SCB in patients with non-dialysis CKD in Myanmar.
Methods: Cross-sectional data of 123 patients with non-dialysis CKD, gathered from a tertiary hospital-based study in Myanmar, were analyzed. Non-dialysis CKD patients who had been diagnosed with CKD for more than 3 months were recruited via convenience sampling. Data were collected using demographic and clinical characteristics data form, and Sodium Consumption Behaviors Questionnaire (SCBQ). Descriptive and inferential statistics were employed for data analysis.
Results: The mean score of SCB was 31.5 (SD=5.1), indicating quite good behaviors. Participants who had high education (β= -.233, *p*= .006) and old age (β= -.169, p= .048) were more likely to have good SCB, whereas participants who took antihypertensive medication (β= .304, *p*= .001) and had comorbidities (β= .232, *p*=.006) were more likely to have poor SCB.
Conclusion: The participants in this study displayed quite favorable SCB. Educational level, age, taking antihypertensive medication, and comorbidity significantly contributed to SCB. Hence, nurses and other healthcare providers should screen patients with these characteristics and provide health education to promote good SCB and prevent the progression of CKD in non-dialysis CKD patients in Myanmar.

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1. Introduction

Chronic Kidney Disease (CKD), one of the significant global non-communicable diseases (NCD), is usually caused by diabetes and hypertension (Cockwell & Fisher, 2020). The incidence and prevalence rates of CKD continue to rise worldwide (Ameh et al., 2020). In the United States, it was found that about 37 million adults suffered from CKD (or more than 1 in 7 US adults), and most are undiagnosed (Centers for Disease Control and Prevention [CDC], 2021). Evidence suggests that CKD is a key contributor to morbidity and mortality (Kaze et al., 2018). It can lead to increased risks of cardiovascular morbidity, anemia, bone mineralization disorder, salt and water retention, electrolyte disturbances, premature mortality, and poor life expectancy (Bello et al., 2017; Singh & Krause, 2021). If people progress to chronic kidney failure (CKF), they need dialysis treatment or kidney transplantation (Braun & Khayat, 2021). Importantly, these treatments are difficult to access, and the cost is extremely high in Myanmar (Alexander et al., 2021). Therefore, slow progression of CKD is essential in this population.

Sodium consumption behaviors (SCB) play a cornerstone in CKD progression and consequences. People living with CKD are salt-sensitive (Nerbass et al., 2018). Reducing sodium intake has the potential to delay the worsening of kidney function and preserve residual kidney function for a longer period, resulting in extending dialysis treatment. A systemic review showed that high sodium consumption can significantly rise the progression of CKD (Kelly et al., 2021). According to WHO (2020), many people daily consume 9-12 grams of salt which is double than WHO recommended level. Cho et al. (2016) revealed that Myanmarese also consumed too much salt due to their food culture and high salt taste threshold. A study by Niyomchit and colleagues (2019) found that the Thai diabetic population had poor SCB and their SCB contributed to CKD progression. Although studies in different countries have highlighted the significance of SCB, knowledge regarding SCB in people with non-dialysis CKD in Myanmar is limited. Only one such study was conducted in Myanmar by Mon et al. (2022) who found that patients with CKD who have not been receiving dialysis treatment (non-dialysis CKD patients) had low to moderate consumption of salt intake, and those who had good SCB had better blood pressure control. Moreover, among Myanmarese with non-dialysis CKD, little is known about factors associated with their SCB. Additional study is needed to explore SCB' associated factors in this underserved population.

Factors thought to influence SCB include both socio-demographic and clinical factors. However, the findings from previous studies are somewhat mixed. Some studies reported that older age was associated with higher sodium consumption in CKD and healthy populations (Meuleman et al., 2018; Reyhani et al., 2020), while some found no association between age and sodium intake in a hypertensive population (Wicaksana et al., 2021). Some previous studies found an influence of gender on SCB in healthy, hypertensive, and type 2 diabetes populations (Aziz et al., 2021; Ko et al., 2018; Reyhani et al., 2020), whereas others found no association in non-dialysis CKD and heart failure patients (Meuleman et al., 2018; Smith et al., 2019). Mestral et al. (2017) conducted a systematic review and reported that individuals with low socioeconomic status had excessive sodium consumption. Similarly, some studies reported educational level as an associated factor of SCB in non-dialysis CKD, dialysis CKD and healthy populations in the Netherlands, US, and Thailand (Brouillard et al., 2019; Chailimpamontree et al., 2020; Meuleman et al., 2018; Santin et al., 2018). However, one study found that education was not a significant factor for SCB in Indian healthy adults (Johnson et al., 2019). Although previous studies have investigated among different populations, no study identified the association of these socio-demographic factors and SCB among Myanmar patients with non-dialysis CKD.

Previous studies have found that CKD severity, comorbid conditions, taking antihypertensive medications, and follow-up care had affected SCB in non-dialysis CKD, diabetic, hypertensive, and healthy populations (Aparna et al., 2019; Burnier et al., 2020; Keasler et al., 2021; Meuleman et al., 2018; Nerbass et al., 2018; Niyomchit et al., 2019; Smith et al., 2019). Welsh et al. (2019) revealed that people with comorbid conditions consumed lower sodium foods due to prescribed regimens or nutrition deficiency. A study also found that people who were receiving hypertensive treatments had lower sodium intake (Hong et al., 2016). Another study in Ghana by Saah et al. (2021) examined that regular follow-up care can reduce unhealthy health related lifestyles, especially consumption of junk foods. However, others reported no association between these clinical factors and SCB in non-dialysis CKD and hypertensive populations (Akbarpour et al, 2018; Meuleman et al, 2018; Petersen et al, 2020).

Although many studies have been conducted to explore the association between socio-demographic and clinical factors and SCB, many of them were conducted in various populations with different contexts, and the results are inconclusive. To date, little is known about the associations between these factors and SCB among non-dialysis CKD patients in Myanmar. Therefore, this study aimed to examine which socio-demographic and clinical characteristics are associated with SCB in this population.

2. Methods

2.1. Research design

This study is a secondary analysis study. A correlational study design was employed to examine the association between socio-demographic and clinical factors and SCB in non-dialysis CKD patients in Myanmar.

2.2. Setting and samples

The primary study was conducted at out-patient clinics in a tertiary hospital in Myanmar from February to May 2020. Data from a hospital-based study to explore blood pressure control in 150 non-dialysis CKD patients by Mon et al. (2022) were used due to data collection challenges during COVID-19 pandemic and political situation in Myanmar. Participants were recruited if they had eGFR less than 60 ml/min/1.73m^2, had never been treated with dialysis, could communicate in Burmese, had no severe physical and mental illnesses, had no cognitive impairment, and had no changes in antihypertensive medications during the past three months. If the participants were diagnosed with psychiatric problems, suffered from severe physical conditions, taking medications affecting blood pressure (i.e., cold medicines, analgesics, immune-suppressants, antacids, oral contraceptives), had changes in hypertensive medications in the past three months, or had cognitive impairment by having a score <9 in General Practitioner Assessment of Cognitive (GPCOG) Patients Examination, and experienced renal replacement therapy, they were excluded. However, this study employed only data from the participants who were diagnosed with CKD for over three months as inclusion criteria to ensure that the behaviors of salt consumption in which the participants' responses are their behaviors during being diagnosed as CKD. Therefore, data of 123 participants were selected.

G-Power software 3.1.9.4 was utilized to assure the appropriateness of the sample size in this study. With a power of 0.85, a significance level of .05, a medium effect size of 0.15 ($f^2 \geq 0.15$) according to Cohen's (1988) guidelines, and 8 independent variables, a minimum sample size of 120 was required. Thus, the number of 123 samples is appropriate for this study.

2.3. Measurement and data collection

Data from the original study were collected by the principal investigator at the outpatient clinics at a tertiary hospital, Myanmar. Details of data collection procedures and measurement were published in the study of Mon et al. (2022). In this study, the independent variables included socio-demographic (age, gender, educational level, income, and follow-up visit) and clinical (CKD severity, comorbidity, and taking antihypertensive medication) characteristics. In this study, the CKD severity (eGFR) was classified based on the CKD stage (eGFR) as follows: stage 3 CKD with eGFR of 30-59 ml/min/1.73m^2 ; stage 4 CKD with eGFR of 15- 29 ml/min/1.73m^2 ; and stage 5 CKD with eGFR of <15 ml/ min/1.73m^2 (KDIGO Work Group, 2013). These data and other characteristics (e.g., marital status, occupation, smoking, alcohol drinking, and cooking meal) were obtained from the demographic and clinical characteristics data form designed by Mon et al. (2022). The participants responded to the part of socio-demographic form during their waiting time at the clinic. The clinical data were collected from medical records with the participants' permission.

The dependent variable in this study was SCB obtained from Sodium Consumption Behavior Questionnaire (SCBQ) developed by Piaseu et al. (2020). The SCBQ was translated into Burmese language by using the back-translation method (Mon et al., 2022). The questionnaire is valid and reliable. The content validity was tested by the experts, and content validity index (CVI) of .95 was found. The Cronbach's alpha of .82 was derived from administering the study questionnaire to 30 participants who had similar characteristics with the samples (Mon et al., 2022). The SCBQ consists of 13 items with 3 subscales. Each item was rated from 1 to 5. Response options range from 'regularly'(1) to 'never'(5) for positive items, and the reverse for negative items. Possible scores range from 13 to 65. Lower scores indicate better SCB. A total score of 13-32 was considered low; 33-51, moderate; and 52-65, high SCB. Then, the researchers obtained the required data for statistical analysis.

2.4. Data analysis

Statistical Package for the Social Science (SPSS) version 18.0 licensed by Mahidol University was used to perform data analysis. The level of significance of $p<.05$ was set. Descriptive statistics were used to describe the characteristics of the participants and study variables. Categorical data were analyzed as frequency and percentage. Continuous data were expressed as mean, and standard deviation. Pearson's product-moment correlation and multiple regression analysis (enter method) were performed to determine the association between the socio-demographic (age, gender, income, education) and clinical factors (CKD severity (eGFR), comorbidity, taking medication, and follow-up visit on SCB among patients with non-dialysis CKD in Myanmar. Assumptions were tested and satisfactorily met.

2.5. Ethical considerations

The researcher used the data after getting approval from Institutional Review Board from Faculty of Nursing, Mahidol University (IRB-NS 2022/28.0703). Permission to use the data was granted from the researchers of the original study. All data were used only for this study and were kept safe from unauthorized access, or accidental loss or destruction. The results were reported as a group and no individual data were identified.

3. Results

3.1. Socio-demographic and clinical characteristics of the participants

The mean age of the participants was 59.3 years (SD = 12.2). Most of the participants were male, married, and employed. The mean family monthly income was 144 USD (SD = 101). Many participants have attained an education at the level of high school or higher. Regarding clinical characteristics, over one-third of participants had CKD Stage 3. A similar number of participants were found in CKD Stages 4 and 5. Most of the participants had comorbidities, took antihypertensive medications, and had regular follow-up visits. Most of the meals were prepared by family members. In addition, most participants added seasoning to their meals. These characteristics of the participants are shown in Table 1.

Table 1. Characteristics of the participants (n=123)

Characteristics	Frequency	Percentage
Age (years) (Mean = 59.3, SD = 12.2, Range = 23-90)		
<44	17	13.8
44-60	42	34.2
61-75	56	45.5
76-90	8	6.5
Gender		
Male	70	56.9
Female	53	43.1
Marital status		
Single	19	15.4
Married	79	64.2
Divorced	2	1.7
Widowed/Widower	23	18.7
Educational level (years)		
0 (No formal education)	18	14.6
9 (Secondary school)	21	17.0
11 (High school)	13	10.6
14 (Diploma)	59	48.0
15 (Bachelor degree)	12	9.8
Occupation		
Unemployed	49	39.8
Own business	17	13.8
Company staff	1	0.8
Government employee	4	3.3
Farmer	25	20.3
Pensioner	9	7.4
Others	18	14.6
Family monthly income (USD) (Mean = 144, SD = 101, Range = 32-539)		
≤80	20	20.3
81 - 300	91	74.0
301 - 539	7	5.7
CKD severity (eGFR) (Mean = 26.8, SD = 16.8, Range = 2-59 ml/min/1.73m^2)		
30-59 (Stage 3)	49	39.8
15-29 (Stage 4)	38	30.9
<15 (Stage 5)	36	29.3

Table 1. Continued

Characteristics	Frequency	Percentage
Comorbidity		
Yes	115	93.5
No	8	6.5
Taking Medication		
Taking antihypertensive medication	104	84.6
Regular follow-up	116	94.3
Irregular follow-up	7	5.7
Reason of irregular follow-up visit		
High cost of treatment	2	28.6
No one to accompany	2	28.6
None specific reasons	3	42.8
Smoking		
Never smoked	85	69.1
Former smoker	36	29.3
Current smoker	2	1.6
Alcohol drinking		
Lifelong abstainer	93	75.7
Current regular drinker	1	0.8
Former occasional drinker	18	14.6
Former regular drinker	11	8.9
Person who prepares/ cooks meal		
By self	27	22.0
Family members	94	76.4
Buying outside	2	1.6

3.2. Sodium consumption behaviors among the participants

As shown in Table 2, the mean score of SCB measured by SCBQ was 31.5 (SD = 5.1) indicating quite a favorable level. More specifically, over half of the participants (56.9%) had a low level of SCB, while 43.1% had a moderate level of SCB. No participants with a high score for SCB were found in this study.

Table 2. Level of sodium consumption behaviors

Level of sodium consumption behaviors	Possible range	Actual range	f	%
Overall (Mean = 31.5, SD = 5.1)	13-65	13-51	123	100.0
Low	13-32	13-32	70	56.9
Moderate	33-51	33-51	53	43.1

Nearly all the participants (90.2%) had never read the nutrition labels, never looked at the amount of sodium, and never bought low-sodium foods. Moreover, most participants reported that they regularly consumed vegetables, had never added seasoning or sauces to their food, and never consumed canned or fast food. However, many reported having snacks sometimes. See the data in Table 3.

Table 3. Sodium consumption behaviors among the participants by items

Sodium consumption behaviors (SCB)	Possible range	Actual range	Frequency of sodium consumption behaviors of the participants n(%)					Mean	SD
			Regularly	Frequently	Sometimes	Rarely	Never		
1. Reading nutrition labels	1-5	3-5	0(0)	0(0)	6(4.9)	6 (4.9)	111(90.2)	4.8	0.5
2. Reading the amount of sodium	1-5	3-5	0(0)	0(0)	6(4.9)	6 (4.9)	111(90.2)	4.8	0.5
3. Buying low sodium food	1-5	3-5	0(0)	0(0)	6(4.9)	6 (4.9)	111(90.2)	4.8	0.5
4. Consuming vegetables	1-3	1-3	83(67.5)	5(4.1)	26(21.1)	7(5.7)	2(1.6)	1.7	1.1
5. Consuming salty food	1-3	1-3	3(2.4)	9(7.4)	47(38.2)	16(13)	48(39)	2.2	1.1
6. Adding seasoning in food	1-3	1-3	2(1.6)	3(2.4)	11(8.9)	6(4.9)	101(82.2)	1.4	0.9
7. Adding sauce in food	1-3	1-3	0(0)	2(1.6)	25(20.4)	16(13)	80(65)	1.6	0.9
8. Eating fruits with salt	1-3	1-3	2(1.6)	3(2.4)	20(16.3)	4(3.3)	94(76.4)	1.5	1.0

Table 3. Continued

Sodium consumption behaviors (SCB)	Possible range	Actual range	Frequency of sodium consumption behaviors of the participants n(%)					Mean	SD
			Regularly	Frequently	Sometimes	Rarely	Never		
9. Consuming processed food	1-3	1-3	3(2.4)	13(10.6)	45(36.6)	24(19.5)	38(30.9)	2.3	1.1
10. Consuming canned food	1-3	1-3	0(0)	0(0)	13(10.6)	3(2.4)	107(87)	1.2	0.6
11. Consuming fast food	1-3	1-3	0(0)	1(0.8)	2(1.6)	3(2.4)	117(95.2)	1.1	0.4
12. Eating snacks	1-3	1-3	2(1.6)	16 (13)	59 (48)	21(17.1)	25 (20.3)	2.6	1.0
13. Drinking beverages	1-3	1-3	1(0.8)	2(1.6)	14(11.4)	10 (8.2)	96(78)	1.4	0.8

3.3. Correlation among the study variables

Regarding the correlations among the study variables, Pearson's product-moment correlation was computed. The findings showed that educational level (r = -.228, *p* = .006) had significant negative correlation with SCB, while comorbidity (r = .230, *p* = .005), follow-up visit (r = .167, *p* = .033), and taking medication (r =.286, *p* = .001) had significant positive correlations with SCB among patients with non-dialysis CKD. No significant correlation among the independent variables was found (Table 4).

Table 4. Correlation matrix of the study variables (n=123)

Variables	1	2	3	4	5	6	7	8	9
1. Age	1								
2. Gender	.146	1							
3. Educational level	.051	-.117	1						
4. Income	-.061	-.224	.168	1					
5. Follow-up visit	.046	.072	-.089	-.051	1				
6. CKD severity (eGFR)	.115	-.024	.114	.057	-.032	1			
7. Co-morbidity	.244	.103	-.071	.056	.065	.022	1		
8. Taking medication	.122	.082	-.007	-.104	.105	-.306	.070	1	
9. SCB	-.113	-.128	-.228**	.136	.167*	-.126	.230**	.286**	1

Notes: Pearson's product-moment correlation, 1=Age; 2=Gender; 3=Education; 4=Income; 5=Follow-up visit; 6=CKD severity (eGFR); 7=Co-morbidity; 8=Taking medication; 9=SCB
**Significant at *p*-value <.01; *Significant at *p*-value <.05

3.4. Multiple linear regression analysis for the factors associated with SCB

As shown in Table 5, the results of multiple linear regression analysis indicated that age, gender, educational level, income, CKD severity, comorbidity, taking antihypertensive medication, and follow-up-visit accounted for 22.4% of the variance in SCB among Myanmarese patients with non-dialysis CKD (R^2 = .224, $F_{(8,114)}$ = 5.396, p<.001). Moreover, age, educational level, comorbidity, and taking antihypertensive medication were significantly associated with SCB. Gender, income, CKD severity (eGFR), and follow-up visit did not significantly contribute to SCB in this population.

Table 5. Factors associated with SCB

Model	B	SE	β	t	*p*-value
Constant	29.338	2.637		11.126	<.001
Age	-0.070	0.035	-0.169	-1.997	.048
Gender	-1.583	0.856	-0.154	-1.850	.067
Educational level	-0.294	0.104	-0.233	-2.830	.006
Income	4.210	0.000	0.156	1.860	.065
CKD severity	0.000	0.026	-0.001	-0.012	.990
Comorbidity	4.789	1.717	0.232	2.790	.006
Taking medication	4.271	1.207	0.304	3.540	.001
Follow-up visit	2.756	1.771	0.126	1.556	.122

Notes:
Multiple linear regression analysis, B: Regression coefficient, SE: Standard error, β: Standardized regression coefficient; R = .524, R-squared = .275, Adjusted R-squared = .224, $F_{(8,114)}$ = 5.396, Significant at *p*-value <.05

4. Discussion

This study measured SCB by the participants' self-report using SCBQ. The mean score of the SCB in the present study indicates that the participants displayed rather favorable SCB, and no participant reported high sodium consumption. These Myanmarese participants reported better SCB than participants in other studies. For example, a study that also used the SCBQ and was conducted in Thailand among healthy nursing students found that the participants' SCB was moderate (Piaseu et al., 2020). Better SCB in this study may be due to the participants' characteristics and the Myanmar context. Myanmar is an agricultural country. Most people consume fresh meat, vegetables, and fruits daily. Fast food, canned food, and snacks are not popular. Conversely, people in Thailand prefer ready-to-eat food such as instant noodles, frozen food, and fast food, and like to season their dishes with condiments such as fish sauce, soy sauce, salt, and seasoning cubes when cooking (Chailimpamontree et al., 2020). Additionally, the participants in this study had been diagnosed with CKD Stages 3 to 5 and, thus, they might have received recommendations from healthcare professionals to limit sodium intake. They may be more concerned about their health conditions and tried harder to comply with the recommendations than their healthier counterparts.

However, it is interesting that most of the participants reported that they had never read the nutrition labels, never looked at the amount of sodium, and never deliberately bought low sodium foods. This finding differs from the results of a cross-sectional study in the US which found that almost a third of participants (31.4%) always read and look at nutrition labels on the packaged foods when buying or selecting the foods (Chan et al., 2019). Even though nutritional labels provide valuable information and help individuals make informed and healthier food choices, most Myanmarese have no interest in understanding about nutritional labels. In addition, there are no low-sodium or sodium-free options in the marketplace in Myanmar for patients who need to limit sodium intake. Access to low-sodium or sodium-free food products is one of the barriers to practicing low sodium consumption in that country. Our findings suggest that providing complete nutritional labels should be mandated, and health education should emphasize reading of nutritional labels and explaining its importance. Nurses should explore effective strategies to increase knowledge and awareness about SCB in this population.

The findings illustrated that taking antihypertensive medication was strongly associated with poor SCB. Non-dialysis CKD patients who were prescribed with anti-hypertensive medications were more likely to perform poorer sodium consumption behaviors than those who were not prescribed with. It is possible that people who are prescribed with antihypertensive medications may believe that they could consume more salty foods because the medications can control their blood pressure. In addition, patients who were prescribed ACE inhibitors had poor salt- taste sensitivity because of taste disturbance, resulting in high sodium intake (Smith et al., 2019).

Similarly, the presence of comorbidity was another clinical characteristic that significantly contributed to poor SCB among this population. This latter finding can be explained by the fact that Myanmarese patients with long-term comorbidities may have difficulty following low salt diet as recommended. They have complex treatment regimens, and they have barriers adhering to healthy consumption habits. This result was in line with previous studies in which the presence of comorbidities was more likely to have more sodium consumption (Meuleman et al., 2018; Nerbass et al., 2018). Previous studies stated that the presence of comorbidities can also influence the behaviors of sodium consumption (Burnier et al., 2020; Welsh et al., 2019).

Among socio-demographic characteristics, educational attainment was significantly associated with SCB in patients with non-dialysis CKD. This finding showed that the higher the education, the lower scores of SCB indicating good sodium consumption behaviors. The reason to explain this finding is that the more well-educated people are likely to have a better understanding about low salt intake. They may have better knowledge and skills to understand health information and benefits of limiting processed food consumption (Jessen et al., 2018). This finding is consistent with previous studies in which people with low education had excessive sodium intake among healthy populations in Montenegro and Korea (Delia et al., 2019; Hong et al., 2016). Interestingly, some studies found that higher education was significantly associated with excessive sodium consumption in different populations (Brouillard et al., 2019; Chailimpamontree et al., 2020). It can be shown that people with secondary level of education consumed more than those with primary education (Chailimpamontree et al., 2020). This might be because although they had high education, they might not have enough health education about healthy and unhealthy nutrition. Therefore, it depends on the diverse backgrounds or different settings of the participants.

Likewise, this study found that, once older, people displayed more favorable SCB. This might be because older people may change their eating behaviors because of their existing health status and more health-conscious (Aziz et al., 2021). In opposite with elderly age, youthful age group consumed ready-made foods and excessive caloric foods. In addition, young people have no intention to alter their current sodium consumption behaviors (Aziz et al., 2021). This finding was consistent with a study found that sodium consumption decreased with age among general population in US (Brouillard et al., 2019). Some previous studies found that younger age had a significant association with higher salt intake among general population in Thailand and Nepal (Chailimpamontree et al., 2020; Neupane et al., 2020). Interestingly, a study in Korea and China found that older age has significant higher sodium consumption than younger age (Hong et al., 2016; Lin et al., 2020). In contrast, some studies found that age cannot significantly predict sodium intake in the hypertensive population (Wicaksana et al., 2021). Hence, the findings depend on the attitude of the participants and setting of the study.

5. Implications and limitations

The findings in this study showed that Myanmarese patients with non-dialysis CKD had a favorable level of SCB. However, they had low practice in reading nutrition labels. Health care providers, including nurses, should provide health education to increase knowledge and skills needed to read and understand nutrition labels in making informed dietary choices. In addition, participants who took antihypertensive medication, had comorbidities, low education, and younger age had poor SCB. Hence, nurses should screen patients with these characteristics and implement effective strategies to promote good SCB and slow progression of CKD in patients with non-dialysis CKD in Myanmar.

The current study has some limitations. First, the results of the study cannot be generalized to the whole population of non-dialysis CKD patients in Myanmar because this study was conducted in a tertiary hospital, and convenience sampling was employed. Second, the behaviors of sodium consumption were self-reported by the participants. The researchers did not measure the actual level of sodium consumption. Last, this cross-sectional study cannot systematically evaluate the behavioral changes of the participants and may not provide causal inferences All these prescribed limitations provide an opportunity for future studies including longitudinal studies, studies conducted in other settings, and studies exploring other factors not examined in this study.

6. Conclusion

This study found that the sample of participants had quite favorable SCB. The influence of socio-demographic and clinical factors on SCB is highlighted. Non-dialysis CKD patients who took antihypertensive medication and had one or more comorbidities were more likely to have poorer SCB, whereas participants who had higher education and older age were more likely to display better SCB. Thus, the findings add to the body of nursing knowledge in Myanmar. Healthcare providers should pay more attention to patients having these characteristics to improve SCB, resulting in decreased progression of CKD. In the future, healthcare providers, including nurses, should encourage low sodium intake when preparing foods and reading nutrition labels on food packaging. There should be a study about SCB in other healthcare settings in Myanmar. In addition, it is recommended to do further research about SCB in non-dialysis CKD by following patients over an extended period. Moreover, future studies should be conducted in other settings to be more generalizable.

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Author contribution

KTH established the study, implemented statistical analysis, and processed the manuscript. AS contributed to the design of the study. AS and WP examined the data and assisted in manuscript revision. KTH also reanalyzed and interpreted the data according to the supervisions, guidance, and suggestions of AS and WP in every aspect of this study. All authors have read and approved the final manuscript.

Conflict of interest

All authors have no conflict of interest in this work.

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