

Factors affecting self-care among community-dwelling hypertensive older adults: A cross-sectional study

Soo Youn Jung  | Kyoung Ja Moon 

College of Nursing, Keimyung University,
Daegu, Korea

Correspondence

Kyoung Ja Moon, College of Nursing,
Keimyung University, 1095 Dalgubeol-
daero, Daegu 42601, Korea.
Email: kjmoon2150@kmu.ac.kr

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Abstract

Aim: To examine self-care behaviours among older adults with hypertension and identify related factors, including cognitive function, religious belief and comorbidities.

Design: A cross-sectional study.

Methods: Self-care behaviours included diet and health. Participants completed a survey including items on demographics, disease-related characteristics and self-care behaviours and underwent cognitive function tests. Data were analysed using descriptive statistics, and multiple regression analysis was performed to analyse the factors affecting self-care.

Results: Regarding diet behaviour, older religious adults and those with higher scores on the Montreal Cognitive Assessment-Korean version had higher levels of self-care scores according to the HBP-SC. Regarding health behaviour, older adults with no comorbidities had higher levels of self-care scores according to the HBP-SC.

Conclusion: Factors affecting self-care diet behaviour include religion and Montreal Cognitive Assessment-Korean version scores and those affecting health behaviour include comorbidities among older adults with hypertension. Therefore, to improve their self-care behaviours, their religious practices and comorbidities should be considered, cognitive function should be assessed, and tailored education should be provided.

Implications for the Profession and/or Patient Care: This study investigated factors affecting self-care behaviours of hypertensive older adults in South Korea. The self-care was divided into diet and health behaviours. The factors influencing diet behaviour were religion and Montreal Cognitive Assessment-Korean version scores, and the factor influencing health behaviour was comorbidities. We also investigated self-care behaviour patterns. Older adults with hypertension were good at controlling alcohol consumption and did not forget to fill prescriptions. However, they were poor at reading nutrition labels to check on sodium content and checking blood pressure at home. Therefore, nurses could develop interventions considering these influencing factors and behavioural patterns to improve self-care behaviours and enhance health for older adults with hypertension.

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Impact: Hypertension in older adults affects their health conditions and performance of self-care behaviours. Nurses could assess self-care based on diet and health behaviours. Additionally, further developing tailored programmes is recommended considering factors like religious belief, cognitive function and comorbidities.

Reporting Method: This study followed the STROBE guidelines.

Patient or Public Contribution: This study used a convenience sample of 105 participants aged ≥ 65 years recruited from a Korean hospital.

KEYWORDS

aged, cognitive dysfunction, hypertension, self-care

1 | INTRODUCTION

Hypertension is a risk factor for cardio-cerebrovascular disease, and its prevalence is increasing in ageing populations globally owing to poor lifestyle habits as well as social and environmental factors, thus making it a major health concern (Mills et al., 2020; World Health Organization, 2013). In South Korea, 64.3% of older adults are hypertensive, which is about 60%–70% in various parts of the world, including Japan, Italy and the United States, indicating its high prevalence worldwide (Korea Centers for Disease Control and Prevention, 2020; Muli et al., 2020; Turana et al., 2021). The prevalence of hypertension among South Koreans aged 65 years or older in 2018 was 5.5 and 3.1 times higher than that of adults in their 30s and 40s, respectively, indicating that it increases with age, affecting over half of the population within this age group (Korea Centers for Disease Control and Prevention, 2020).

Self-care is defined as 'the actions individuals take to lead a healthy lifestyle; to meet their social, emotional and psychological needs; to care for their long-term condition; and to prevent further illness' (Kennedy et al., 2007). Self-care is accepted as a practical endeavour because it is directed towards specific regulations of human functioning and development through deliberate result-seeking actions under existent or changing environmental conditions (Denyes et al., 2001). In this article, we use a definition of self-care that addresses both prevention and management of chronic illness, with the core elements of self-care maintenance, monitoring and management (Riegel et al., 2012). Therefore, for older adults with hypertension, identifying the factors affecting self-care is necessary to lead a healthy lifestyle and regulate hypertension.

2 | BACKGROUND

The predominant type of hypertension among older adults is isolated systolic hypertension, in which the elasticity of blood vessels decreases due to ageing, with the resulting stiffness increasing systolic blood pressure and decreasing diastolic blood pressure (Oliveros et al., 2020). Therefore, older adults with hypertension are at a high risk of developing complications, such as cardio-cerebrovascular and kidney diseases. Lowering the blood pressure of patients prone to

What does this paper contribute to the wider global clinical community?

1. Self-care for hypertension could be assessed by dividing them into diet and health behaviours.
2. Cognitive function needs to be considered in self-care behaviours for older adults with hypertension.
3. To improve self-care behaviours in hypertensive older adults, nurses could provide tailored programmes considering the influencing factors.

complications associated with hypertension may reduce mortality. Therefore, engaging in healthy diet and lifestyle habits is important to maintain health and cope with hypertension (Benetos et al., 2019; Oliveros et al., 2020).

As hypertension is a chronic disease, implementing preventive self-care measures is important for patients to prevent and treat complications associated with it (Kushner & Sorensen, 2013). Hypertension self-care behaviours include following a diet and healthy lifestyle habits such as smoking cessation, drinking in moderation (e.g., 12 oz of regular beer or 5 oz of wine per day), home blood pressure monitoring, weight control, physical activity, medication compliance and stress management (Whelton et al., 2018; Williams et al., 2018). Various environmental exposures, including components of diet and physical activity, influence blood pressure. Additionally, diet is regarded as a risk factor for hypertension and a non-pharmacological intervention strategy (Whelton et al., 2018). Diet and obesity can be controlled to an extent by following the Dietary Approaches to Stop Hypertension (DASH) diet (Filippou et al., 2020). Adopting the DASH diet, which is rich in vegetables, fruits and low-fat dairy products, was found to significantly reduce blood pressure (Shimbo, 2016).

The blood pressure guidelines of the American College of Cardiology (ACC)/American Heart Association (AHA) and the European Society of Cardiology (ESC)/European Society of Hypertension (ESH) regard hypertension in older adults as a special consideration owing to the age, frailty and comorbidities of the patients (Whelton et al., 2018; Williams et al., 2018). Older adults are

at higher risk of falls, cognitive decline and comorbidities, and thus, their blood pressure can decrease owing to consumption of multiple medications (Whelton et al., 2018). Therefore, self-care to maintain blood pressure through non-pharmacological interventions, such as having a healthy lifestyle, is important (Whelton et al., 2018; Williams et al., 2018).

Older adults with hypertension may experience self-care limitations owing to their impaired cognitive function or may have a significantly increased prevalence of dementia and mild cognitive impairment (MCI) (Anto et al., 2019; Oliveros et al., 2020; Whelton et al., 2018). Cognitive impairment has the potential to not only interfere with but also hinder blood pressure self-monitoring (Lovell et al., 2019). Therefore, testing cognitive function is important to identify the self-care ability of older adults.

Effective performance of self-care behaviours necessary for preventing or managing hypertension requires identifying multiple individual barriers (Riegel et al., 2012). According to past studies, factors that affect self-care behaviours in older adults include diabetes, marital status, education, age and gender in the United States (Douglas & Howard, 2015); age, gender, employment status, diabetes and obesity in South Korea (Kim & Son, 2012); age, educational level and living situation in Poland (Uchmanowicz et al., 2018); and gender, educational level, economic status and religious beliefs in Taiwan (Bai et al., 2009). Moreover, older adults with chronic diseases may experience problems with self-care behaviours because of cognitive deficits (Sinclair et al., 2000; Uchmanowicz et al., 2017). However, there are few studies on cognitive function as an influencing factor in older adults with hypertension (Klymko et al., 2011). Therefore, identifying the factors essential for promoting self-care behaviours in older adults with hypertension is necessary.

Previous studies investigated the influencing factors for hypertension self-care. Some studies in Korea used a questionnaire for the self-care behaviour of hypertensive patient and identified empowerment, social support, depression, perceived severity, income and gender as influencing factors (Chang & Lee, 2015; Jeong et al., 2017; Lee, 1995). Using 'the Hill-Bone Compliance to High Blood Pressure Therapy Scale (Hill-Bone CHBPTS)' measured adherence and identified age, educational level and living with the family (Kim et al., 2000; Uchmanowicz et al., 2018). Furthermore, sex, age, educational status and disease duration were identified as risk factors using the Hypertension Self-Care Activity Level Effects (H-scale) (Genremichael et al., 2019; Warren-Findlow & Seymour, 2011). However, few studies have investigated the factors affecting self-care in older adults with hypertension. Therefore, more studies focusing on such factors are needed.

In this study, the Hypertension Self-Care Behaviour Scale (HBP-SC) has been divided into diet and health (An et al., 2017). The HBP-SC behaviour items are associated with self-care maintenance, monitoring and management as the core elements of self-care. Self-care maintenance refers to those behaviours performed to preserve health or maintain physical stability by preparing healthy food, smoking cessation and taking medication as prescribed. Self-care monitoring is a process of routine, vigilant body monitoring by

monitoring blood pressure. Self-care management involves an evaluation of changes in physical signs and symptoms by regularly visiting a doctor (Riegel et al., 2012). Hence, this study investigates self-care and analyses the subcategories of diet and health behaviours in community-dwelling older adults with hypertension. Furthermore, it investigates and determines the factors affecting self-care, including cognitive function.

3 | THE STUDY

3.1 | Aim and objective

- Determining self-care and analysing the subcategories of diet and health behaviours in community-dwelling older adults with hypertension.
- Investigating the factors affecting self-care, including cognitive function.

4 | METHODS

4.1 | Design

This cross-sectional study was conducted in S General Hospital, with an average of 800 outpatients per day, located in Sangju City (small and medium-sized city with a population of 100,000), South Korea, from October 2019 to May 2020. The study participants comprised 105 community-dwelling adults aged 65–91 years. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational studies were followed (Appendix S1).

4.2 | Sampling and recruitment

The participants were adults aged 65 years or older who visited the outpatient clinic at S General Hospital, received treatment for hypertension and agreed to participate in this study by providing written consent after its purpose was explained.

4.3 | Sample size and power

The number of participants required for this study was calculated to be 103 after performing a multiple regression analysis with a significance level of 0.05, a power of 0.80 and an effect size of 0.15 (medium) using G*Power and seven predictors (i.e., demographic status, education level, body mass index [BMI], disease-related characteristics, comorbidities, Korean Mini-Mental State Examination [K-MMSE] and Montreal Cognitive Assessment-Korean version [MoCA-K]) (Douglas & Howard, 2015; Faul et al., 2009; Goldstein et al., 2017; Green, 1991; Harkness et al., 2014; Jeong et al., 2017). Considering a dropout rate of 10%

(Sharma et al., 2020), 110 participants were selected. Of them, five had incomplete information; thus, 105 participants were included in this study.

4.4 | Population and sample

4.4.1 | Inclusion and/or exclusion criteria

The inclusion criteria were as follows: participants had to (1) be adults aged 65 years or older who could communicate verbally and non-verbally (gestures), (2) have a systolic blood pressure of ≥ 140 mmHg or a diastolic blood pressure of ≥ 90 mmHg after taking rest for at least 5 min in the outpatient clinic (Whelton et al., 2018), (3) have been diagnosed with hypertension by an internist and (4) have been taking antihypertensive drugs for more than 6 months. The exclusion criterion was participants with secondary hypertension. Secondary causes of hypertension include primary aldosteronism, renovascular hypertension, Cushing's syndrome and hypothyroid hypertension, which are treated through surgical or medical elimination (Streeten et al., 1990).

4.5 | Data collection

Data were collected after explaining the study's purpose and process to the hospital authorities and obtaining their permission. After receiving consent from the participant or their family member, a one-on-one survey using a questionnaire that examined the participants' characteristics, cognitive function and hypertension-related self-care behaviours was conducted by the researcher in a counselling room next to the internal medicine outpatient clinic.

4.6 | Instrument with validity and reliability

4.6.1 | Population characteristics

The demographic characteristics section of the survey included eight items regarding age, sex, educational level, religion, marital status, living with family, primary caregiver and BMI. The disease-related section consisted of three items regarding the duration of hypertension, number of hypertensive drugs used and comorbidities.

4.6.2 | Cognitive function measures

Older adults' cognitive function was measured using the K-MMSE and MoCA-K (Shen et al., 2016; Trzepacz et al., 2015). The K-MMSE is a tool for screening dementia that was modified and translated into Korean by Kang et al. (1997) based on the MMSE developed by Folstein et al. (1975). It consists of items related to time and

place orientation, memory registration, attention and calculation, memory recall, language and drawing. A score of 24 points or more indicates normal cognition, ≥ 18 to ≤ 23 points indicate MCI, and ≤ 17 points indicate dementia. In terms of reliability, the K-MMSE had Cronbach's α of 0.90 in a recent study (Jung et al., 2021) and 0.74 in this study.

The MoCA-K is a tool for screening MCI that was modified and translated into Korean to be suitable for the Korean culture and linguistic characteristics by Kang et al. (2009), based on the original MoCA developed by Nasreddine et al. (2005). This tool comprises items on visuospatial ability/executive function, language ability, memory/delayed recall, attention, abstraction and orientation, amounting to a total score of 30 points. One point is added to a respondent's score if they have 6 years or less of formal education. A score of 23 points or higher is considered normal, whereas 22 points or lower is indicative of MCI. The reliability of the MoCA-K revealed Cronbach's α of 0.84 during its translation and modification and 0.79 in this study.

4.6.3 | Hypertension self-care scale

The HBP-SC Behaviour Scale was translated and modified for Korean older adults by An et al. (2017) based on the Hypertension Self-Care Profile developed by Han et al. (2014). It comprises 20 items, including 11 diet-related items that assess the respondents' habits of checking nutrition labels, sodium intake, total calories and alcohol consumption, and nine items related to health behaviour including exercise, smoking cessation, antihypertensive medication compliance and regular health screening. Each item is rated on a 4-point Likert scale, with scores ranging from 20 to 80 points. Higher scores indicate better self-care behaviours.

The reliability of the HBP-SC Behaviour Scale revealed Cronbach's α of 0.92 for HBP-SC (total score), 0.91 for HBP-SC diet and 0.85 for HBP-SC health behaviour in a prior study (An et al., 2017); in this study, Cronbach's α values were 0.73, 0.77 and 0.65, respectively.

4.7 | Data analysis

Descriptive statistical analyses were performed to investigate the general characteristics, hypertension-related characteristics and cognitive function of the participants. The differences in their self-care behaviours based on their characteristics were analysed using a *t*-test or analysis of variance. A post hoc test was performed using Scheffé's method. The correlations between the participants' characteristics and hypertension-related self-care behaviours were analysed using Pearson's correlation coefficients. Multiple regression analysis (enter linear regression, with an exit threshold of 0.10, β estimations and tests to zero by *t*-test) was used to explore the factors affecting participants' hypertension-related self-care behaviours. The multicollinearity

of independent variables was examined by calculating the variance inflation factor (VIF). To avoid multicollinearity bias in linear regression, variables with VIF exceeding 10 must be discarded (Schroeder et al., 1990). In this study, the VIF of each independent variable was less than 10.

The general significance level was set to 0.05. The reliability of the HBP-SC Behaviour Scale, K-MMSE and MoCA-K was analysed based on their Cronbach's α values. The data were analysed using the Statistical Package for the Social Sciences for Windows (version 22.0; IBM Corporation).

4.8 | Ethical considerations

This study was approved by the Institutional Review Board of K University located in Daegu City, South Korea (40525-201906-HR-029-02). After the purpose, procedure and time required for this study were explained to the participants or a family member, informed consent for study participation was obtained. This study was conducted in accordance with the tenets of the Declaration of Helsinki and Good Clinical Practice guidelines.

5 | RESULTS

5.1 | Demographic, disease-related and cognitive characteristics

The participants' characteristics and cognitive function are shown in Table 1. The majority of participants, 56.2%, were women. Their mean age was 76.17 years, with the highest proportion, 49.5%, being in their 70s. Most participants, 74.3%, had received no or only primary education. Overall, 61.9% reported having religious affiliations specifically, Buddhism 30.5%, Catholicism 8.6% and Christianity 22.9%, whereas 38.1% did not. In terms of BMI, 39.0% had normal weight, 33.4% were overweight and 27.6% were obese. Regarding their marital status, 57.1% had a spouse, and regarding living with family, 65.7% lived with their families. Although 34.3% of participants mentioned their spouses as a primary caregiver, 43.8% mentioned themselves. In terms of disease-related characteristics, the mean duration of hypertension was 10.85 years, and the mean number of antihypertensive medications was 1.46. Moreover, 85.7% of the participants had multiple disorders. The types of comorbidities included diabetes 45.7%, cerebrovascular disease 23.8%, cardiovascular disease 13.3% and kidney disease 7.6% (multiple responses). In terms of their K-MMSE scores, 41% of participants were normal, 53.3% had MCI, and 5.7% had dementia, with scores ranging from 10 to 30 points (mean, 22.83 points). MoCA-K scores were obtained for 99 participants, excluding the six with dementia as identified by the K-MMSE. The results revealed that 29.5% of the participants were normal and 64.8% had MCI, with MoCA-K scores ranging from 11 to 29 points (mean, 19.82 points).

5.2 | Differences in self-care behaviours by characteristics

Comparisons of hypertension self-care behaviours based on demographic and disease-related characteristics are shown in Table 2. The HBP-SC diet scores for those with and without religious affiliations were 29.35 and 27.70 points, respectively ($F = 2.36$; $p = 0.020$). The HBP-SC health behaviour scores were higher among those with secondary education or higher educational qualifications ($F = 3.20$; $p = 0.001$), married individuals ($F = 2.76$; $p = 0.007$) and those living with their families ($t = 3.16$; $p = 0.002$). In terms of comorbidities, the HBP-SC health behaviour scores were higher among those without comorbidities ($F = 2.72$; $p = 0.008$), whereas the HBP-SC behaviour (total) scores were higher among those with secondary education or higher educational qualifications ($t = -3.28$; $p = 0.004$), those living with their families ($F = 2.08$; $p = 0.040$) and those without comorbidities ($F = 2.13$; $p = 0.036$).

The characteristics of each item on the HBP-SC Behaviour Scale are shown in Table 3. With respect to HBP-SC diet, the score for the item 'Practice moderation in drinking alcohol daily' was the highest at 3.76 points, whereas the score for the item 'Read nutrition labels to check information on sodium content' was the lowest at 1.15 points. With respect to HBP-SC health behaviour, the score for the item 'Not forgetting to fill your prescriptions' (reversely scored) was the highest at 3.90 points, whereas the score for the item 'Do you check your blood pressure at home?' was the lowest at 2.17 points. The mean scores for HBP-SC diet, health behaviour and behaviour (total) were 28.72, 29.04 and 57.78 points, respectively.

5.3 | Relationship between self-care behaviours and related factors

MoCA-K scores were significantly correlated with HBP-SC diet scores ($r = 0.27$; $p < 0.010$), HBP-SC health behaviour scores ($r = 0.32$; $p < 0.010$) and HBP-SC behaviour (total) scores ($r = 0.35$; $p < 0.001$) in older adults with hypertension. K-MMSE scores were significantly correlated with HBP-SC health behaviour scores ($r = 0.26$; $p < 0.010$) (Table 4).

5.4 | Factors affecting self-care Behaviours among older adults with hypertension

Only significant independent variables were included in the multiple linear regression analysis. Examining the fit of the regression model revealed that the VIF was in the range of 1.02–6.99 (smaller than 10), and it appropriated multicollinearity between the variables.

The results of the multiple regression analysis to determine factors affecting self-care behaviours among older adults with hypertension revealed that religion ($\beta = 0.27$; $SE = 0.69$; $p = 0.007$) and MoCA-K scores ($\beta = 0.31$; $SE = 0.08$; $p = 0.002$) significantly affected HBP-SC diet, and the explanatory power of these factors was

TABLE 1 Demographic, disease-related and cognitive characteristics (N = 105).

Characteristics	Categories	n (%)	M ± SD (range)
Demographic			
Gender	Female	59 (56.2)	76.17 ± 6.54 (65–91)
	Male	46 (43.8)	
Age (years)	65–69	21 (20.0)	
	70–79	52 (49.5)	
	≥80	32 (30.5)	
Education	Primary or none	78 (74.3)	
	Secondary	27 (25.7)	
Religion	Yes	65 (61.9)	
	No	40 (38.1)	
Type of religions	Buddhism	32 (30.5)	
	Catholicism	9 (8.6)	
	Christianity	24 (22.9)	
	None	40 (38.1)	
BMI (kg/m ²) ^a	Normal	41 (39.0)	23.72 ± 3.43 (14.0–39.5)
	Overweight	35 (33.4)	
	Obese	29 (27.6)	
Marital status	Spouse (+)	60 (57.1)	
	Spouse (–)	45 (42.9)	
Living with family	Yes	69 (65.7)	
	No	36 (34.3)	
Caregiver types	Spouse	36 (34.3)	
	Children	21 (20.0)	
	Employed caregiver	2 (1.9)	
	Self-care	46 (43.8)	
Disease-related			
Duration of HBP ^b (years)	≤10	63 (60.0)	10.85 ± 7.66 (1–40)
	≥11	42 (40.0)	
Number of HBP ^b medication	1	68 (64.8)	1.46 ± 0.68 (1–4)
	2	26 (24.8)	
	≥3	11 (10.4)	
Comorbidities	Yes	90 (85.7)	
	No	15 (14.3)	
Types of comorbidities (multiple responses)	Diabetes	48 (45.7)	
	Cerebrovascular	25 (23.8)	
	Cardiovascular	14 (13.3)	
	Kidney	8 (7.6)	
	Others	62 (59.0)	
Cognitive function			
K-MMSE ^c	Normal	43 (41.0)	22.83 ± 4.06 (10–30)
	MCI ^d	56 (53.3)	
	Dementia	6 (5.7)	
MoCA-K ^e	Normal	31 (29.5)	19.82 ± 6.32 (11–29)
	MCI ^d	68 (64.8)	
	Known dementia	6 (5.7)	

^aBody mass index.^bHigh blood pressure.^cKorean Mini-Mental State Examination.^dMild cognitive impairment.^eMontreal Cognitive Assessment-Korean version.

TABLE 2 HBP-SC behaviours by demographic and disease-related characteristics (N = 105).

Characteristics	HBP-SC (diet behaviour) M ± SD	t (F)	p	HBP-SC (health behaviour) M ± SD	t (F)	p	HBP-SC (Total score) M ± SD	t (F)	p
Demographic									
Gender	Female	28.73 ± 3.34	0.02	28.66 ± 2.15	-1.96	0.053	57.41 ± 4.22	-0.90	0.372
	Male	28.72 ± 3.88		29.52 ± 2.34			58.26 ± 5.54		
Age (years)	65-69	29.85 ± 4.99	1.58	29.00 ± 2.27	0.44	0.645	58.85 ± 6.33	1.19	0.308
	70-79	28.71 ± 3.30		29.23 ± 2.24			57.98 ± 4.60		
	≥80	28.06 ± 2.83		28.76 ± 2.33			56.82 ± 4.10		
Education	Primary or none	28.24 ± 3.19	-2.40	28.64 ± 2.20	3.20	0.001	56.91 ± 4.34	-3.28	0.004
	Secondary	30.11 ± 4.26		30.19 ± 2.06			60.30 ± 5.37		
Religion	Yes	29.35 ± 3.81	2.36	28.86 ± 2.39	-1.02	0.310	58.22 ± 5.16	1.18	0.242
	No	27.70 ± 2.89		29.33 ± 2.03			56.90 ± 4.41		
BMI (kg/m ²) ^a	Normal	28.66 ± 3.69	0.59	29.24 ± 2.44	1.21	0.301	57.93 ± 4.89	1.16	0.317
	Overweight	29.23 ± 3.67		29.26 ± 2.17			58.51 ± 5.00		
	Obese	28.21 ± 3.30		28.48 ± 2.09			56.69 ± 4.53		
	Spouse (+)	28.95 ± 3.86	0.75	29.55 ± 2.10	2.76	0.007	58.52 ± 5.13	1.82	0.072
Marital status	Spouse (-)	28.42 ± 3.17		28.36 ± 2.32			56.80 ± 4.27		
	Yes	28.94 ± 3.91	0.86	29.52 ± 2.17	3.16	0.002	58.48 ± 5.05	2.08	0.040
Living with family	No	28.31 ± 2.80		28.11 ± 2.16			56.44 ± 4.14		
	Spouse	28.94 ± 4.24	0.31	29.47 ± 2.30	1.05	0.373	58.44 ± 5.74	0.41	0.747
Caregiver types	Children	28.14 ± 3.62		29.24 ± 2.32			57.38 ± 4.58		
	Employed caregiver	30.00 ± 0.00		29.00 ± 2.83			59.00 ± 2.83		
	Self-care	28.76 ± 3.06		28.61 ± 2.19			57.39 ± 4.27		
Disease-related									
Duration of HBP ^b (years)	≤10	28.52 ± 3.47	-0.70	29.05 ± 2.51	0.53	0.958	57.60 ± 4.86	-0.46	0.647
	≥11	29.02 ± 3.74		29.02 ± 1.85			58.05 ± 4.85		
Number of HBP ^b medication	1	28.91 ± 3.71	0.46	29.00 ± 2.42	0.15	0.858	57.93 ± 5.10	0.29	0.749
	2	28.62 ± 2.83		29.23 ± 1.48			57.85 ± 2.91		
	≥3	27.82 ± 4.38		28.82 ± 2.89			56.73 ± 6.81		
Comorbidities	Yes	28.57 ± 3.47	1.11	28.80 ± 2.15	2.72	0.008	57.38 ± 4.63	2.13	0.036
	No	29.67 ± 4.12		30.47 ± 2.48			60.20 ± 5.47		

TABLE 2 (Continued)

Characteristics	HBP-SC (diet behaviour) M ± SD			HBP-SC (health behaviour) M ± SD			HBP-SC (Total score) M ± SD		
	t (F)	p		t (F)	p		t (F)	p	
Types of comorbidities(multiple responses)									
Diabetes	29.23 ± 3.56			28.83 ± 2.30			58.10 ± 5.00		
Cerebrovascular	28.96 ± 2.98			29.72 ± 1.77			58.72 ± 3.82		
Cardiovascular	29.07 ± 3.61			29.00 ± 2.51			58.14 ± 5.05		
Kidney	29.00 ± 4.18			29.00 ± 2.51			58.00 ± 5.73		
Others	28.48 ± 3.43			28.77 ± 2.10			57.27 ± 4.56		

^aBody mass index.

^bHigh blood pressure.

13%. In contrast, while having comorbidities ($\beta = -20$; SE = 0.60; $p = 0.032$) significantly affected the HBP-SC health behaviour, education, marital status, living with family, types of comorbidities, K-MMSE scores and MoCA-K scores were insignificant. The explanatory power of the model was 22% (Table 5).

6 | DISCUSSION

This study identified factors affecting HBP-SC behaviours, including cognitive function, among older adults with hypertension and analysed overall HBP-SC behaviours, stratified into diet and health behaviour categories. The factors affecting HBP-SC diet in older hypertensive patients were religion and MoCA-K scores, whereas the factor affecting HBP-SC health behaviours was having comorbidities.

Religion is an important aspect of older adults' lives (Kim et al., 2008). Religion may be related to physical health owing to constraining health-injurious behaviours, social integration and consolation (Ferraro & Kim, 2014; Huebner, 2022). Regarding physical health, the beneficial effects of religious involvement extend to self-rated health and physical functioning (Page et al., 2020). Several studies suggest that religious people may experience health benefits owing to healthier diets and lower rates of heavy alcohol consumption (Hill et al., 2006; Sabaté, 2004). Religion as a factor affecting HBP-SC diet behaviour corresponded with the findings of a previous study, which revealed that older adults who frequently attend religious events were more likely to practice health-promoting behaviours (Musich et al., 2018). Moreover, it plays an important role by offering them beneficial instructions about health practices such as diet and exercise (Naewbood et al., 2012). In particular, faith community nurses could provide health-related services to diverse population and advocate for appropriate levels of care for vulnerable populations, such as older adults (Huebner, 2022). Thus, as religion may affect self-care behaviours in older hypertensive adults, health interventions including diet should be designed based on this finding to promote self-care (Saffari et al., 2019). As the possible mechanism underlying religion and hypertension is complex and can partially explain the differing results among various populations, further research on this topic is required (Meng et al., 2019).

This study revealed that lower MoCA-K scores were associated with lower HBP-SC diet, comparable to the results of a previous study (Harkness et al., 2014), which showed that lower MoCA scores indicated poorer self-care behaviours among older adults with cardiovascular disease (Lovell et al., 2019). People with MCI were found to be less healthy, lived unhealthy lifestyles and performed significantly worse in preparing meals. The deterioration in the ability to engage in diet behaviour depends on cognitive function (Ahn et al., 2009; Jiang & Xu, 2014). Hence, screening for cognitive impairment is needed to ensure the prevention of potential self-care deficits (Cameron et al., 2017). In addition, tailored self-care behaviour education programmes that carefully consider older adults' cognitive function are needed to manage hypertension (Rovner et al., 2020).

TABLE 3 Comparison of the means obtained using the HBP-SC behaviour items.

Domain	Items	M ± SD
HBP-SC (Diet behaviour)	1. Read nutrition fact labels to check for information on sodium content?	1.15 ± 0.41
	2. Replace traditional high-salt foods (e.g., canned soups, Oodles of Noodles) with low-salt products (e.g., homemade soups, fresh vegetables)?	2.70 ± 0.76
	3. Limit use of high-salt condiments (e.g., ketchup)?	2.60 ± 0.68
	4. Eat less than one teaspoon of table salt per day (6 g)?	2.58 ± 0.68
	5. Eat less food that is high in saturated fats (e.g., red meat, butter) and trans fats (e.g., shortening, lard)?	2.93 ± 0.58
	6. Use broiling, baking, or steaming instead of frying when cooking?	3.04 ± 0.57
	7. Read nutrition labels to check info on saturated fats (e.g., butter, red meat) and trans fats (e.g., lard, shortening)?	1.19 ± 0.54
	8. Replace traditional high-fat foods (e.g., deep fried chicken) with low-fat products (e.g., baked chicken)?	3.01 ± 0.49
	9. Limit total calorie intake from fat (less than 65 g) daily?	3.01 ± 0.61
	10. Eat five or more servings of fruits and vegetables daily?	2.63 ± 0.67
	11. Practice moderation in drinking alcohol daily (two glasses or less for men; one glass or less for women)?	3.76 ± 0.60
HBP-SC (Health behaviour)	12. Take part in regular physical activity (e.g., 30 min of walking 4–5 times per week)?	2.45 ± 0.92
	13. Practice non-smoking?	3.80 ± 0.66
	14. Check your blood pressure at home?	2.17 ± 0.98
	15. Not forgetting to take your blood pressure medicine? (reverse)	3.88 ± 0.51
	16. Not forgetting to fill your prescriptions? (reverse)	3.90 ± 0.48
	17. Keep your weight down?	2.93 ± 0.67
	18. Monitor situations that cause a high level of stress (e.g., arguments, death in the family) resulting in blood pressure elevation?	2.94 ± 0.39
	19. Engage in activities that can lower stress (e.g., deep breathing, meditation)?	3.02 ± 0.37
	20. See a doctor regularly?	3.85 ± 0.46
HBP-SC (Diet behaviour score)	M ± SD	28.72 ± 3.57
HBP-SC (Health behaviour score)	M ± SD	29.04 ± 2.26
HBP-SC (Total score)	M ± SD	57.78 ± 4.84

Variables	HBP-SC (diet behaviour)		HBP-SC (health behaviour)		HBP-SC (Total score)	
	r	p	r	p	r	p
MoCA-K ^a scores	0.27	<0.010	0.32	<0.010	0.35	<0.001
K-MMSE ^b scores	0.13	0.175	0.26	<0.010	0.22	<0.050
Age	-0.10	0.324	-0.04	0.699	-0.09	0.360
Duration of HBP ^c	0.08	0.397	-0.03	0.764	0.05	0.646
Number of HBP ^c medication	-0.09	0.361	0.00	0.991	-0.06	0.524

^aMontreal Cognitive Assessment-Korean version.

^bKorean Mini-Mental State Examination.

^cHigh blood pressure.

TABLE 4 Correlation between HBP-SC behaviours and factors (N = 105).

With respect to comorbidities being a factor affecting HBP-SC health behaviour, a previous study indicated that the presence of comorbidities in older adult patients with heart failure and

cognitive impairment negatively affected their self-care behaviours (Uchmanowicz et al., 2017), which corresponds with the findings of this study. However, this study differed in terms of the participants,

TABLE 5 Factors affecting HBP-SC behaviours (N = 105).

Variables	Categories	B	SE	β	p	R ²	Adj R ²	F (p)
HBP-SC (Diet behaviour)	Religion ^a	1.93	0.69	0.27	0.007	0.14	0.13	8.05 (0.001)
	MoCA-K	0.24	0.08	0.31	0.002			
HBP-SC (Health behaviour)	Education ^a	0.32	0.64	0.06	0.622	0.31	0.22	0.3.51 (<0.001)
	Marital status ^a	0.26	0.59	0.06	0.655			
	Living with family ^a	1.04	0.57	0.21	0.072			
	Comorbidities ^a	-1.92	0.76	-0.29	0.013			
	Diabetes ^a	-0.04	0.46	-0.01	0.932			
	Cerebrovascular ^a	0.69	0.55	0.13	0.092			
	Cardiovascular ^a	0.17	0.69	0.02	0.806			
	Kidney ^a	0.16	0.81	0.02	0.840			
	Others ^a	0.25	0.52	0.05	0.627			
	K-MMSE scores	0.11	0.15	0.18	0.458			
	MoCA-K scores	0.02	0.13	0.04	0.866			
HBP-SC (Total score)	Education ^a	1.48	1.41	0.14	0.299	0.23	0.15	2.67 (0.007)
	Living with family ^a	1.43	1.04	0.14	0.174			
	Comorbidities ^a	-3.21	1.68	-0.23	0.060			
	Diabetes ^a	1.24	1.01	0.13	0.225			
	Cerebrovascular ^a	2.19	1.23	0.19	0.078			
	Cardiovascular ^a	0.20	1.53	0.01	0.897			
	Kidney ^a	0.50	1.80	0.03	0.780			
	Others ^a	-0.05	1.15	-0.01	0.968			
	K-MMSE scores	-0.11	0.34	-0.08	0.752			
MoCA-K scores	0.34	0.28	0.31	0.233				

^aDummy variables: religion (no religion: 0; Christian, Catholic and Buddhist: 1), education level (below primary school: 0; middle school graduate or above: 1), marital status (no: 0; yes: 1), living with family (no: 0; yes: 1), comorbidities (no: 0; yes: 1), diabetes (no: 0; yes: 1), cerebrovascular (no: 0; yes: 1), cardiovascular (no: 0; yes: 1), kidney (no: 0; yes: 1) and other (no: 0; yes: 1).

which only included older adults with hypertension. Moreover, older adults with hypertension and comorbidities have a poor ability to care for themselves. Comorbidities are barriers to self-care owing to physical limitations, a lack of knowledge, financial constraints, aggravation of existing conditions and multiple problems with medications (Bayliss et al., 2003). Considering these findings, comorbidities in older adults with hypertension should be considered when attempting to improve self-care.

The item analysis results of the HBP-SC diet revealed that the score for the item 'Practice moderation in drinking alcohol daily' was the highest; this resulted in low alcohol consumption, which is consistent with previous studies (Kim & Son, 2012; Uchmanowicz et al., 2018). The score for the item 'Read nutrition labels to check information on sodium content when purchasing food' regarding self-care maintenance was the lowest. This result highlighted the importance of enhancing awareness among Korean older adults to check nutrition labels when purchasing food. However, the results of a study (Han et al., 2014) in the United States revealed that the score for the item 'Read the nutrition labels when purchasing food' was the highest, indicating a difference between Korean and American older adults. Another study revealed that the use of nutrition labels developed in an easy format for older adults had positive effects (Jackey et al., 2017). Therefore, conducting further studies on the effects of

simple nutrition labelling for older adults with hypertension in South Korea is necessary to ensure a reduction in their sodium intake.

The results of the item analysis of the HBP-SC health behaviour revealed that the score for the item 'Not forgetting to fill your prescriptions' was the highest. As the National Health Insurance in South Korea covers outpatient care and prescription pharmaceuticals, community-dwelling hypertensive patients commonly visit outpatient clinics (Park, 2015). In contrast, the score for 'check my blood pressure at home' was the lowest. 'Check my blood pressure at home' indicates a routine process for self-care monitoring. A study revealed that continuous blood pressure monitoring at home, along with data entry into a mobile device and personalized interventions, was effective in controlling blood pressure levels (Buis et al., 2020). Thus, a home-based blood pressure tele-monitor to control hypertension or a national healthcare approach that provides home blood pressure monitors could be explored for older adults in South Korea (Hong et al., 2017).

6.1 | Strength and limitations of the work

This study is significant for the following reasons: First, HBP-SC behaviours were classified into two categories: diet and health behaviours. In other studies, dietary behaviour was measured as a

part of self-care (Han et al., 2014; Uchmanowicz et al., 2018). The importance of diet has been increasingly emphasized. The adoption of a healthy diet, such as the DASH diet, has been found to prevent obesity (a risk factor for hypertension) and reduced blood pressure (Shimbo, 2016). The ACC/AHA and ESC/ESH blood pressure guidelines suggested weight loss, a healthy diet such as the DASH diet, reducing sodium intake, enhancing potassium intake, increasing physical activity and controlling alcohol consumption as important, non-drug intervention strategies for hypertension, most of which are related to dietary habits (Whelton et al., 2018; Williams et al., 2018).

Second, cognitive function was assessed using the K-MMSE and the MoCA-K, both of which are validated tools for assessing older adults with hypertension. Those who had normal cognitive function according to the K-MMSE were identified and classified as having MCI using the MoCA-K. The factors affecting their self-care behaviours were then analysed. Studies have shown that hypertension among older adults not only causes complications but also reduces cognitive function (Jeong et al., 2017) and that those with MCI have higher rates of progression to dementia than those without MCI (Abdelhafiz et al., 2018; Goldstein et al., 2013; Hughes et al., 2020). Therefore, it is important to detect cognitive impairment with optimal screening before initiating an intervention. Nurses can contribute to improving self-care through health education and coaching for older adults with high blood pressure and cognitive problems (Jeffs et al., 2017; Yorozuya et al., 2019).

Despite these insightful findings, this study had some limitations. Cronbach's α value of the HBP-SC Behaviour Scale and explanatory power of this study were lower than those observed during the development of the original tool (An et al., 2017) and in another study that employed the same scale (Kim, 2019). Another study that involved older adults with normal cognitive function included participants with K-MMSE scores of 25 points or higher (Kim, 2019), which were higher than those of the participants in this study, whose mean K-MMSE score was 22.83 points. Therefore, the differences in Cronbach's α values and explanatory power may be owing to the differences in the cognitive function of the participants in the two studies.

Previous studies found some subjective data such as resilience, motivation, depression, self-efficacy and empowerment (Chang & Lee, 2015; Jeong et al., 2017). Subjective data were not included in this study. Therefore, future studies including these data are needed.

Since this study only considered data from hypertensive older adults who visited a single general hospital, the generalizability of its results may be limited.

6.2 | Recommendations for further research

A tailored education programme could be designed to improve the diet and health behaviour of HBP-SC, considering factors such as religion belief, cognitive function and comorbidities (Naewbood

et al., 2012; Rovner et al., 2020). Future studies that identify the influencing factors, including subjective data on diet and health behaviours, are required to provide more effective education programmes for older adults with hypertension.

7 | CONCLUSION

Factors affecting self-care diet behaviour include religion belief and MoCA-K scores, and those affecting health behaviour include comorbidities among older adults with hypertension. Therefore, to improve their self-care behaviours, their religious practices and comorbidities should be accounted for, their cognitive function should be assessed, and tailored education should be imparted.

AUTHOR CONTRIBUTIONS

Conceptualization or/and methodology: KJM, SYJ. Data collection or/and analysis: SYJ, KJM. Writing: original draft or/and review and editing: SYJ, KJM.

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CONFLICT OF INTEREST STATEMENT

The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

DATA AVAILABILITY STATEMENT

Author elects to not share data.

RESEARCH ETHICS COMMITTEE APPROVAL

This study was approved by the Institutional Review Board of K University located in Daegu City, South Korea (40525-201906-HR-029-02).

ORCID

Soo Youn Jung  <https://orcid.org/0000-0002-1245-9834>

Kyoung Ja Moon  <https://orcid.org/0000-0002-3475-739X>

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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