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Original Article

Determinants of concurrent use of Biomedicine and Korean Medicine on the hypertension patients: a cross-sectional study

Jang Won Lee ^a, Min Kyung Hyun ^{a,*}, Ji Hyun Lee ^b^a Department of Preventive Medicine, College of Korean Medicine, Dongguk University, Gyeongju, Republic of Korea^b Hanjoong Hospital of Korean Medicine, Bucheon, Republic of Korea

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ABSTRACT

Background: This study assessed the utilization of biomedicine and Korean Medicine (KM) among hypertension patients.**Methods:** The study was a cross-sectional analysis conducted using the Korean National Health and Nutrition Examination Survey (KNHANES), which is a nationwide survey conducted every year for a representative Korean population. The use of outpatient healthcare services for hypertension patients was analyzed, and the usage determinants adjusted by the demographic and health status variables were identified. A chi-square test and logistic regression analysis were used for statistical analysis using R (version 3.6.0).**Results:** Among 3320 hypertension patients, 208 patients (6.27%, Weighted%: 5.99%) used the biomedicine and KM concurrently. Multivariable regression analyses revealed hypertension patients who were obese (OR: 1.417, CI: 1.007–1.995) and had an experience of sickness (OR: 2.323, CI: 1.561–3.457) to be more likely to use biomedicine and KM concurrently.**Conclusion:** The utilization rate and determinants of the concurrent use of biomedicine and KM were identified in patients with hypertension. Although the overall usage rate was not high, the health care patterns of healthcare consumers need to be understood. Therefore, further studies on its effectiveness and safety are recommended.© 2020 Korea Institute of Oriental Medicine. Publishing services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Hypertension is a major chronic disease with a worldwide prevalence of more than 1.13 billion patients in 2015, according to WHO Global Health Observatory (GHO) data.¹ In 2016, the prevalence of hypertension in the Republic of Korea and the US was 29%.^{2,3}

Some hypertensive patients may prefer to use complementary medicines (CMs) because of dissatisfaction with conventional treatments or side effects associated with treatment.⁴ In addition, studies of the potential effectiveness of acupuncture for hypertension showed that the use of acupuncture with conventional medicine is more effective than using only conventional medicine.^{5,6} Other reports have shown that various CMs are used to treat hypertension in the US, Europe, Australia, Nigeria, and

Congo.^{7–11} In Taiwan, 337 types of powdered herbal preparations are covered by national insurance and are prescribed for chronic disease, including hypertension patients.^{12,13} On the other hand, traditional Korean Medicine (KM) used in the Republic of Korea focuses mainly on neurological and musculoskeletal disorders rather than chronic diseases, including hypertension.^{12,14} Therefore, few studies have examined the use of KM for hypertension.

Therefore, this study was conducted to identify the utilization rate and determinants of the concurrent use of biomedicine and KM in patients with hypertension using the Korean National Health and Nutrition Examination Survey (KNHANES) data.

2. Method

2.1. Study design and data source

A cross-sectional study was performed using the 2010–2014 data that conducted surveys on medical utilization among the fifth and sixth KNHANES. This data is an ongoing nationwide cross-sectional survey conducted every year targeting the nationally

* Corresponding author at: Department of Preventive Medicine, College of Korean Medicine, Dongguk University, 123, Dongdae-ro, Gyeongju-si, Gyeongsanbuk-do 38066, Republic of Korea.

E-mail address: mk3three@dongguk.ac.kr (M.K. Hyun).

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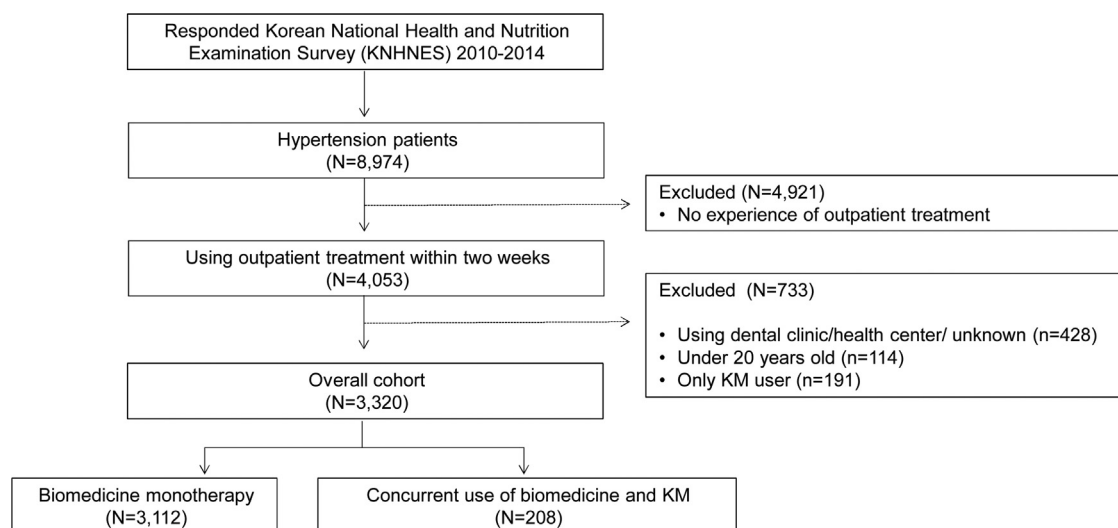


Fig. 1. Selection of subjects.

representative non-institutionalized Korean civilian population.¹⁵ In addition, the KNHANES was stratified using a multistage probability sampling design to ensure that the homogeneous and independent sample had been extracted, and was composed of three questionnaires: a health interview survey, a health behavior survey, and a health examination. The fifth and sixth KNHANES were conducted from 2010 to 2014, with response rates of 80.8% and 78.3%, respectively.

2.2. Participant selection

Of the 41,102 respondents in the fifth and sixth KNHANES, 8974 subjects (21.83%) were hypertension patients. Hypertension was defined as follows: an average systolic blood pressure (SBP) ≥ 140 mmHg, a diastolic blood pressure (DBP) ≥ 90 mmHg, or taking hypertension medicine. Blood pressure measurements were performed by professional nurses.

First, patients with hypertension were selected, and the utilization status of the medical institutions was investigated. Among those who experienced outpatient use, the following participants were excluded: those who used dental clinics, public health centers or unknown (428 patients), aged under 20 years (114 patients), and used KM services alone (191 patients). Medical institutions users were defined as patients who answered “yes” to the “Have you visited any medical institutions in the last two weeks?”. Biomedicine and KM users were defined as patients who responded to the both “clinics, hospitals, or general hospitals” and “Korean medicine clinics or Korean medicine hospitals” in response to “What medical institution did you use?”, and biomedicine monotherapy users as patients who responded to the just “clinics, hospitals, or general hospitals”.

Finally, 81.91% (3320 patients) of hypertension patients were selected as the final study participants. Of these, 208 patients (6.27%, weighted 5.99%) used biomedicine and KM concurrently, and 3122 patients (93.73%, weighted 94.01%) used biomedicine monotherapy only (Fig. 1).

2.3. Independent variables

The sociodemographic factors of the study participants included the following: age, gender, education period (0–6 years, 7–9 years, 10–12 years, or more than 13 years), body mass index (under 18.5, between 18.5 and 25, or over 25), smoking status (smoking or non-smoking), alcohol status (drinking or non-drinking), income

level (divide into quartile), occupation (white-collar, blue-collar, or unemployment), medical security (national health, or medical care), and private medical insurance (have private medical insurance or do not have private medical insurance). In addition, stress status (feel stress or not), subjective health status (good, normal, or bad), an experience of sickness over the past two weeks (yes or no), diabetes mellitus (diagnosed by a physician or not), dyslipidemia (diagnosed by a physician or not), stroke (diagnosed by a physician or not), angina pectoris (diagnosed by a physician or not), and myocardial infarction (diagnosed by a physician or not) were included.

2.4. Statistical analysis

Statistical analyses were performed using the R (version 3.6.0). Data were analyzed using the weights given in the KNHANES. All data were presented as a frequency percentage and weighted frequency percentage for the categorical variables. A Chi-square test was used to assess the differences in the categorical data between the concurrent use of biomedicine and KM, and biomedicine monotherapy only. Univariate and multivariable logistic regression analyses were performed to estimate the odds ratio (OR) and adjusted odds ratio (aOR) with the 95% confidence interval (CI), and determine the association between the two groups. The adjusted odds ratio was adjusted for the following variables: as age, gender, education period, body mass index, smoking, alcohol, income level, occupation, stress status, subjective health status, an experience of sickness over the last two weeks, diabetes mellitus, dyslipidemia, stroke, angina pectoris, and myocardial infarction. A p -value < 0.05 was considered statistically significant.

3. Results

3.1. Characteristics of the study population.

Table 1 lists the characteristics of 3320 hypertension patients included in this study. No significant differences in age, education period, smoking, and alcohol were observed between the concurrent users of biomedicine and KM and the users of biomedicine only. On the other hand, significant differences in gender, subjective health status, experienced sickness over the last two weeks, and diabetes mellitus were observed between the two groups.

Table 1
Baseline Characteristics of the Study Participants.

Variable	Concurrent use of biomedicine and KM N (% , weighted %)	Biomedicine monotherapy N (% , weighted %)	p-value
Total	208 (6.27, 5.99)	3112 (93.73, 94.01)	
Age			0.8063
20–39	6 (2.88, 4.65)	102 (3.28, 5.96)	
40–49	11 (5.29, 8.45)	228 (7.33, 11.43)	
50–59	38 (18.27, 25.68)	619 (19.89, 25.11)	
60–69	66 (31.73, 28.55)	1018 (32.71, 27.85)	
70+	87 (41.83, 32.68)	1145 (36.79, 29.64)	
Gender**			0.0165
Male	64 (30.77, 34.30)	1259 (40.46, 45.11)	
Female	144 (69.23, 65.70)	1853 (59.54, 54.89)	
Education period			0.0724
0–6 years	122 (58.94, 55.42)	1621 (52.19, 47.86)	
7–9 years	29 (14.01, 15.05)	457 (14.71, 14.50)	
10–12 years	40 (19.32, 22.43)	655 (21.09, 23.04)	
More than 13 years	16 (7.73, 7.10)	373 (12.01, 14.60)	
Body Mass Index			0.0678
~18.5	0 (0.00, 0.00)	52 (1.67, 1.63)	
18.5–25	102 (49.28, 45.43)	1653 (53.22, 51.55)	
25–	105 (50.72, 54.57)	1401 (45.11, 46.82)	
Smoking			0.0689
Yes	18 (8.65, 11.35)	447 (14.36, 17.83)	
No	190 (91.35, 88.65)	2665 (85.64, 82.17)	
Alcohol			0.4337
Yes	76 (36.89, 42.44)	1258 (40.84, 45.87)	
No	130 (63.11, 57.56)	1822 (59.16, 54.13)	
Income level			0.3716
Quartile 1	54 (26.09, 29.93)	779 (25.26, 25.59)	
Quartile 2	45 (21.74, 22.26)	862 (27.95, 28.75)	
Quartile 3	58 (28.02, 25.82)	753 (24.42, 23.90)	
Quartile 4	50 (24.15, 21.99)	690 (22.37, 21.76)	
Occupation			0.9516
White collar	14 (6.76, 8.62)	238 (7.67, 9.48)	
Blue collar	71 (34.30, 40.98)	1158 (37.32, 40.53)	
unemployment	122 (58.94, 50.39)	1707 (55.01, 49.99)	
Medical security			0.1714
National health	204 (98.08, 97.36)	3079 (98.94, 98.84)	
Medical care	4 (1.92, 2.64)	33 (1.06, 1.16)	
Private medical insurance			0.9444
Yes	104 (50.00, 56.95)	1586 (50.96, 56.66)	
No	104 (50.00, 43.05)	1526 (49.03, 43.34)	
Stress			0.0527
Yes	69 (33.50, 35.03)	807 (26.18, 27.49)	
No	137 (66.50, 64.97)	2276 (73.82, 72.51)	
Subjective health status**			0.0048
Good	26 (12.50, 15.36)	611 (19.65, 19.27)	
Normal	75 (36.06, 34.89)	1343 (43.20, 45.02)	
Bad	107 (51.44, 49.75)	1155 (37.15, 35.71)	
Experience of sickness for the last two weeks**			<0.0001
Yes	140 (67.31, 62.90)	1318 (42.35, 40.49)	
No	68 (32.69, 37.10)	1794 (57.65, 59.51)	
Diabetes mellitus**			0.0008
Yes	32 (15.38, 10.57)	680 (21.85, 20.35)	
No	176 (84.62, 89.43)	2432 (78.15, 79.65)	
Dyslipidemia			0.8148
Yes	48 (23.08, 19.79)	664 (21.34, 20.55)	
No	160 (76.92, 80.21)	2448 (78.66, 79.45)	
Stroke			0.1304
Yes	13 (6.25, 5.20)	118 (3.79, 3.24)	
No	195 (93.75, 94.80)	2994 (96.21, 96.76)	
Angina pectoris			0.3884
Yes	13 (6.25, 5.04)	132 (4.24, 3.81)	
No	195 (93.75, 94.96)	2980 (95.76, 96.19)	

Table 1 (Continued)

Variable	Concurrent use of biomedicine and KM N (% , weighted %)	Biomedicine monotherapy N (% , weighted %)	p-value
Myocardial infarction			0.3118
Yes	6 (2.88, 2.29)	45 (1.45, 1.43)	
No	202 (97.12, 97.71)	3067 (98.55, 98.57)	

KM, Korean Medicine.

Bold values signifies that the p-values are statistically significant.

** p-value <0.05.

3.2. Factors associated with the concurrent use of biomedicine and KM

Table 2 lists the results of univariate logistic regression and multivariable logistic regression of the factors associated with the concurrent use of biomedicine and KM. Univariate logistic regression analyses revealed female (OR: 1.574, CI: 1.028–2.411), hypertension patients who reported ‘feel stress’ (OR: 1.423, CI: 1.017–1.990), and had an experience of sickness (OR: 2.492, CI: 1.601–3.880) to be more likely to use both biomedicine and KM. On the other hand, hypertension patients who had a higher education level (more than 13 years, OR: 0.420, CI: 0.241–0.823) and hypertension patients with diabetes mellitus (OR: 0.463, CI: 0.319–0.670) were less likely to use both biomedicine and KM.

In multivariable logistic regression analyses, hypertension patients with a body mass index of more than 25 (aOR: 1.417, CI: 1.007–1.995) and hypertension patients who reported an experience of sickness (aOR: 2.323, CI: 1.561–3.457) were more likely to use both biomedicine and KM. Hypertension patients with diabetes mellitus (aOR: 0.407, CI: 0.247–0.671) were less likely to use both biomedicine and KM.

Similar result patterns of the observed associations showed further sensitivity analyses of female hypertension patients (Table 3). On the other hand, there were differences in occupations for female hypertension patients. Female hypertension patients who were blue-collar (aOR: 0.217, CI: 0.069–0.683) and unemployed (aOR: 0.219, CI: 0.072–0.667) were less likely to use both biomedicine and KM than white-collar workers. In addition, female hypertension patients with diabetes mellitus (aOR: 0.366, CI: 0.196–0.684) were less likely to use both biomedicine and KM.

4. Discussion

The utilization rate and determinants of the concurrent use of biomedicine and KM in patients with hypertension were analyzed using a representative national survey, KNHANES. This study identified 6.27% (weighted 5.99%) of hypertension patients who used both biomedicine and KM concurrently. This is much lower than the concurrent use of biomedicine and KM rate of 16–18% in a previous study for all diseases.¹⁶ The rate of KM utilization for patients with hypertension was lower than in other countries: 43.1% CMs utilization rate of United Kingdom hypertension patients¹⁷; and those of African countries, such as South Africa (21%),¹⁸ Nigeria (29%),¹⁹ Sierra Leone (56.9%)²⁰ and Ghana (19.5%).²¹ In Taiwan, which has a similar medical system to the Republic of Korea, approximately 80% of hypertension patients reported the use of traditional Chinese medicine (TCM).¹³ This difference in utilization rates of T&CM is due primarily to differences in the definitions and scope of T&CM in each study. These differences may also be due to differences in the duration of T&CM, as defined in each study, as well as differences in insurance coverage in each country. Indeed, the number of herbal medicines covered in Taiwan is far greater than that of the Republic of Korea.²²

Table 2
Factors Associated With the Concurrent Use of Biomedicine and KM

Variable	Univariate regression	Multivariate regression
Age		
20–39	1 (ref)	1 (ref)
40–49	0.948 (0.304–2.960)	0.829 (0.250–2.747)
50–59	1.311 (0.496–3.466)	1.054 (0.353–3.147)
60–69	1.314 (0.513–3.367)	1.028 (0.346–3.050)
70+	1.414 (0.549–3.640)	1.099 (0.354–3.409)
Gender		
Male	1 (ref)	1 (ref)
Female	1.574 (1.028–2.411)	1.128 (0.649–1.961)
Education period		
0–6 years	1 (ref)	1 (ref)
7–9 years	0.896 (0.577–1.392)	1.055 (0.576–1.931)
10–12 years	0.841 (0.491–1.439)	1.044 (0.595–1.832)
More than 13 years	0.420 (0.214–0.823)	0.438 (0.174–1.102)
Body Mass Index**		
<18.5	–	–
18.5–25	1 (ref)	1 (ref)
≥25	1.323 (0.858–2.038)	1.417 (1.007–1.995)
Smoking		
Yes	0.590 (0.316–1.104)	0.646 (0.333–1.251)
No	1 (ref)	1 (ref)
Alcohol		
Yes	0.870 (0.579–1.308)	1.193 (0.761–1.870)
No	1 (ref)	1 (ref)
Income level		
Quartile 1	1 (ref)	1 (ref)
Quartile 2	0.662 (0.426–1.030)	0.643 (0.367–1.125)
Quartile 3	0.924 (0.554–1.540)	0.993 (0.598–1.650)
Quartile 4	0.864 (0.547–1.365)	0.993 (0.598–1.650)
Occupation		
White collar	1 (ref)	1 (ref)
Blue collar	1.111 (0.482–2.560)	0.701 (0.317–1.549)
unemployment	1.108 (0.514–2.389)	0.601 (0.262–1.378)
Medical security		
National health	0.431 (0.094–1.973)	0.535 (0.106–2.697)
Medical care	1 (ref)	1 (ref)
Private medical insurance		
Yes	1.012 (0.716–1.431)	1.149 (0.764–1.729)
No	1 (ref)	1 (ref)
Stress		
Yes	1.423 (1.017–1.990)	1.175 (0.793–1.740)
No	1 (ref)	1 (ref)
Subjective health status		
Good	1 (ref)	1 (ref)
Normal	0.973 (0.555–1.704)	0.896 (0.509–1.578)
Bad	1.749 (0.987–3.098)	1.369 (0.764–2.454)
Experience of sickness for the last two weeks**		
Yes	2.492 (1.601–3.880)	2.323 (1.561–3.457)
No	1 (ref)	1 (ref)
Diabetes mellitus**		
Yes	0.463 (0.319–0.670)	0.407 (0.247–0.671)
No	1 (ref)	1 (ref)
Dyslipidemia		
Yes	0.954 (0.672–1.353)	0.916 (0.602–1.394)
NO	1 (ref)	1 (ref)
Stroke		
Yes	1.638 (0.838–3.199)	1.503 (0.764–2.955)
No	1 (ref)	1 (ref)
Angina pectoris		
Yes	1.343 (0.650–2.774)	1.168 (0.573–2.382)
No	1 (ref)	1 (ref)
Myocardial infarction		
Yes	1.609 (0.739–3.500)	1.470 (0.556–3.889)
No	1 (ref)	1 (ref)

KM, Korean Medicine.

** *p*-value <0.05.**Table 3**
Factors Associated with the Concurrent use of Biomedicine and KM Among Women

Variable	Multivariate regression
Age	
20–39	1 (ref)
40–49	0.335 (0.049–2.291)
50–59	0.408 (0.060–2.778)
60–69	0.525 (0.076–3.644)
70+	0.484 (0.066–3.517)
Education period	
0–6 years	1 (ref)
7–9 years	1.038 (0.475–2.271)
10–12 years	0.698 (0.356–1.369)
More than 13 years	0.414 (0.088–1.934)
Body Mass Index	
~18.5	–
18.5–25	1 (ref)
25–	1.169 (0.766–1.784)
Smoking	
Yes	0.548 (0.138–2.258)
No	1 (ref)
Alcohol	
Yes	1.413 (0.827–2.416)
No	1 (ref)
Income level	
Quartile 1	1 (ref)
Quartile 2	0.915 (0.476–1.758)
Quartile 3	1.041 (0.537–2.015)
Quartile 4	0.900 (0.452–1.793)
Occupation	
White-collar	1 (ref)
Blue-collar	0.217 (0.069–0.683)
unemployment	0.219 (0.072–0.667)
Medical security	
National health	1.711 (0.350–8.364)
Medical care	1 (ref)
Private medical insurance	
Yes	1.144 (0.716–1.829)
No	1 (ref)
Stress	
Yes	1.219 (0.769–1.932)
No	1 (ref)
Subjective health status	
Good	1 (ref)
Normal	0.710 (0.353–1.428)
Bad	1.244 (0.605–2.561)
Experience of sickness for the last two weeks**	
Yes	2.761 (1.582–4.819)
No	1 (ref)
Diabetes mellitus	
Yes	0.366 (0.196–0.684)
No	1 (ref)
Dyslipidemia	
Yes	1.311 (0.804–2.138)
No	1 (ref)
Stroke	
Yes	1.337 (0.531–3.366)
No	1 (ref)
Angina pectoris	
Yes	1.469 (0.663–3.259)
No	1 (ref)
Myocardial infarction	
Yes	1.444 (0.464–4.489)
No	1 (ref)

KM, Korean Medicine.

** *p*-value <0.05.

On the other hand, this research showed that the determinants of hypertension patients using concurrent usage of biomedicine and KM were body mass index, an experience of sickness, and diabetes mellitus. This is different from the use of determinants of a previous study of all patients, i.e., concurrent users, were more likely to be female, over 40 years old, have lower confidence in the quality of healthcare services, chronic disease, used medication for more than three months, and a high mean frequency of medical services use.¹⁶ According to studies conducted in other countries, in Uganda,²³ residential areas and medical experience were the determinant factors. In addition, in Ghana,²¹ gender and the price of hypertension drugs were the determinant factors, and in Malaysia,²⁴ age and residential areas were the determinant factors. In Australia, however, similar to the present study, females with hypertension were generally less likely to consult with CAM practitioners and less likely to use self-prescribed CAM.¹¹

In the Republic of Korea, the treatment rate of patients with hypertension was 61%, and the control rate was 44%, which was higher than the global average (36.9%, 13.8%).^{2,25} Compared to developed countries, however, the treatment and control rates were low. For example, the reported control rate of patients with hypertension was 48.3%³ in the United States; Canada showed a reported treatment rate of 80.5% and a control rate of 65.9%; Germany reported a treatment rate of 72% and a control rate of 51%.²⁶ Biomedicine and various attempts are needed to improve the treatment and control rate of patients with hypertension. This study analyzed the determinants of the utilization of KM in hypertension patients and provided valuable information to manage hypertension patients effectively.

This study had some limitations due to the limitations of the KNHANES data. First, it was not possible to consider factors, such as the duration of hypertension, types of hypertension drugs being taken, and accessibility to all kinds of clinics and hospitals. Second, the comprehensive and accurate medical use status of hypertension patients may not have been identified. This is because the utilization of the medical services was limited within two weeks of the survey period, and there was no specific medical use information. For example, KNHANES reported data on medical utilization and did not report data on the type of treatment received. Moreover, it was not possible to know how hypertension patients were treated in Korean medical institutions. Finally, a five-year cross-sectional review did not reflect the changes in determinants that could occur over the five years. Despite these limitations, the KNHANES data is an annual representative survey that needs to be analyzed to assess the utilization status of hypertensive patients. In conclusion, this study showed that 6.27% (weighted 5.99%) of hypertension patients used biomedicine and KM concurrently, and the determinants of this concurrent use were related to obesity and sickness experiences. Despite being lower than the average concurrent utilization, it is necessary to check it during the treatment process in terms of understanding the health care patterns of healthcare consumers. Further studies on its effectiveness and safety will also be needed because it may affect the treatment outcomes.

Author contribution

MKH, JWL, JHL: planned the study
 JWL, JHL: performed the analysis
 JWL, MKH, JHL: wrote the original draft
 MKH, JWL: critically reviewed and revised the paper

Conflict of interest

The authors declare no conflict of interest.

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Ethics statement

This study was approved by the Institutional Review Board of Dongguk University, Gyeongju (DRG IRB 20170019). Patient consent was exempted because of the total anonymity of all research data used in this study.

Data availability

The datasets analyzed during the current study are available from a public database of the Korea National Health and Nutrition Examination Survey (KNHANES) upon reasonable request (<https://knhanes.cdc.go.kr/knhanes/eng/index.do>).

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