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Hypertension Care Quality and Incidence of Complications Among Hypertensive Patients With Disabilities in Korea: An Analysis of a Cohort Study Using National Health Insurance Data

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ABSTRACT

Background: Hypertension is more prevalent among individuals with disabilities than in the general population. This study analyzed long-term trends in disparities in hypertension care quality and the incidence of hypertensive complications among individuals with and without disabilities.

Methods: This retrospective cohort study followed 52,743 hypertensive patients aged 20 or older with disabilities newly diagnosed in 2010, along with 47,564 age- and sex-matched patients without disabilities, from 2011 to 2019. Hypertension care quality was assessed using indicators of medication adherence and the completion of three complication-monitoring tests at recommended frequency: blood test, urine test, and electrocardiogram (ECG). Hypertensive complications included major cardiovascular and cerebrovascular events, kidney diseases, and all-cause mortality. Logistic regression was repeated annually to assess hypertension care quality, and Cox-proportional model was used to estimate the risk of hypertension-related complications.

Results: Hypertensive patients with disabilities consistently demonstrated lower medication adherence throughout the study period (adjusted odds ratio [aOR], 0.90–0.96, depending on the year), but a higher likelihood of undergoing screenings at recommended frequency (e.g., aOR for blood test, 1.31–1.39, for urine test, 1.24–1.33, and for ECG, 1.30–1.37). The risk of complications remained significantly higher among hypertensive patients with disabilities, even after adjusting for care quality indicators (e.g., adjusted hazard ratio for cardiovascular events: 1.36, 95% confidence interval: 1.31–1.41). Subgroup analyses revealed that the excess

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Disclosure

The authors have no potential conflicts of interest to disclose.

Data Availability Statement

Data that support the findings of this study are not publicly available but can be obtained on request. The data were used with permission by the Korean National Health Insurance Service (KNHIS) for the current study (http://nhiss.nhis.or.kr).

Author Contributions

Conceptualization: Park J, Shin DW. Data curation: Han K, Jung JH. Investigation: Lee HY, Kim K, Shin DW, Park J. Formal analysis: Han K, Jung JH. Methodology: Han K, Jung JH, Park J. Writing - original draft: Lee HY. Writing - review & editing: Kim K, Shin DW, Park J.

risks for complications varied across different sociodemographic groups.

Conclusion: These findings underscore the need for comprehensive strategies to enhance medication adherence among hypertensive patients with disabilities. Additionally, other factors beyond medication adherence and monitoring test completion that contribute to the increased risk of complications require further exploration.

Keywords: Disability; Hypertension; Medication Adherence; Care Quality; Korean Health Insurance Data

INTRODUCTION

Chronic diseases impose a significant and growing burden globally, including in Korea.[1,2] As of 2021, hypertension was the most prevalent chronic condition in the country, affecting 28.1% of the population aged 19 years or older.[3] Despite often being asymptomatic, hypertension contributes to increased mortality and morbidity, by causing complications such as coronary heart disease, stroke, and end-stage kidney disease.[4,5] However, many of these complications can be prevented by controlling blood pressure within the normal range through proactive management, including lifestyle modification strict adherence to medication regimens, and vigilant monitoring for complications.[6-8] Previous studies have demonstrated that the association between blood pressure levels and cardiovascular (CV) disease risk is linear and continuous, emphasizing the importance of early intervention and consistent control of blood pressure.[9]

Hypertension is notably more prevalent among individuals with disabilities compared to the general population, due to various factors, including reduced physical activity and a higher prevalence of obesity in this group.[10] Studies by Kim et al.[11] in Korea and Lennox et al.[12] in Australia have confirmed this trend, reporting a higher prevalence of both obesity and hypertension in individuals with disabilities relative to their non-disabled counterparts, indicating that the quality of hypertension management in this population deserves focused attention.

While it is well-documented that individuals with disabilities utilize healthcare services more frequently than those without disabilities,[13-16] research on the quality of healthcare services they receive remains limited, with existing studies reporting mixed findings.[17-20] Studies specifically addressing hypertension care quality among people with disabilities are even scarcer. To our knowledge, only one study in Korea has examined medication adherence in hypertensive patients with disabilities.[21] However, this study was limited by its reliance on data from a single year, and the exclusion of Medical Aid enrollees, who account for nearly 20% of the individuals with mental disabilities. To date, no study has comprehensively investigated the quality of hypertension care, encompassing both medication adherence and follow-up screening for complications, in hypertensive patients with disabilities. Moreover, the incidence of hypertension-related complications in this population also remains understudied.[22]

Given these gaps, the present study aimed to analyze long-term trends in disparities in hypertension care quality between hypertensive patients with and without disabilities from 2011 to 2019. Additionally, this study seeks to examine differences in the incidence of hypertensive complications between these two groups, with and without adjustment for care quality indicators.

METHODS

Data sources

In this study, we conducted the analysis using data linked from two population-based datasets: the National Disability Registry (NDR) and the National Health Insurance (NHI) database in Republic of Korea (South Korea). The NDR covered approximately 94.1% of individuals with disabilities in South Korea as of 2017.[23,24] We obtained information on disability type and severity from 2010 to 2019 from this dataset. The NHI database contains detailed information on healthcare service utilization for the entire population of Korea, submitted by healthcare providers nationwide for reimbursement purposes.[25] The NHI database consists of several sub-datasets, of which we used three: 1) the enrollee database for basic sociodemographic information; 2) the claims database for data on diagnoses and healthcare services utilized; and 3) the death database for mortality information.

Study design and population

This retrospective cohort study examined hypertensive patients newly diagnosed in 2010, including both individuals with and without disabilities. A representative sample of 1,198,785 individuals with disabilities aged 20 years or older was randomly selected, constituting 50% of the total population with disabilities in this age group as of the end of 2009 (**Supplementary Fig. 1**). An equal number of age- and sex-matched individuals without disabilities were selected, with age matching conducted in 10-year intervals (20–29, 30–39, 40–49, 50–59, 60–69, 70–79, and 80+ years).

From this dataset, we excluded individuals with missing information on covariates, those who died within one year of the index date, and those without a hypertension diagnosis in 2010 (**Supplementary Fig. 1**). To identify patients newly diagnosed with hypertension in 2010, we further excluded individuals with a prior hypertension diagnosis recorded in 2009. This cohort was used to analyze the long-term trends in disparities in hypertension care quality between individuals with and without disabilities from 2011 to 2019. To analyze the association between disability and the incidence of hypertensive complications, we derived a second cohort by further excluding patients who had hypertension-related complications during 2009–2010 (**Supplementary Fig. 1**), which was followed until 2019.

Hypertension diagnoses in the NHI claims database were defined as having either two or more outpatient visits or any hospitalization related to hypertension, identified by the codes I10, I11, I12, and I13 in the International Classification of Diseases, 10th Revision (ICD-10), during the relevant year.

Outcome variables

We assessed two categories of outcome variables: 1) the quality of hypertension care and 2) the incidence of hypertension-related complications. The quality of care was evaluated based on medication adherence to antihypertensive drugs and the completion of three essential diagnostic tests at recommended frequencies to monitor potential organ damage: blood tests, urine tests, and electrocardiogram (ECG).

Medication adherence was quantified using the Medication Possession Ratio (MPR), calculated as the total number of days' supply of hypertensive drugs divided by the total number of days in a year. The MPR was dichotomized, with adherence defined as an MPR of ≥ 80%, a benchmark commonly used in previous studies.[26-28] For the diagnostic monitoring,

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hypertension management guidelines recommend annual blood and urine analyses as well as ECG for low-risk patients.[8]

Hypertension-related complications included major CV events (e.g., heart failure), kidney diseases (e.g., acute renal failure), cerebrovascular events (e.g., cerebral infarction), and all-cause mortality. These conditions were identified using ICD-10 codes, as detailed in **Supplementary Table 1**.

Independent variables

Our primary independent variables were disability status, including its severity and type. The NDR classifies disabilities into 15 types in accordance with the Korean Welfare Law for Persons with Disabilities. For this study, we consolidated these into four broader categories (**Supplementary Table 2**): mobility-related disabilities, communication-related disabilities, mental disabilities, and a composite category labeled 'others.' Disability severity is officially graded on a scale from 1 (most severe) to 6 (least severe), reflecting the extent of functional loss and clinical severity, as determined by a medical specialist. For our analysis, we dichotomized this scale into two groups: severe (grades 1–3) and mild (grades 4–6).

Covariates included in the analyses of hypertension care quality were sex, age (categorized into four groups: 20–39, 40–64, 65–74, and 75 years or older), income level (classified into five categories: Medical Aid beneficiaries and quartiles [Q1–Q4] of health insurance enrollees; see **Supplementary Methods** for details), and residential area (urban vs. rural). Urban areas were defined as Seoul and six metropolitan cities, while the remaining ten provinces were classified as rural. In the analysis of hypertension-related complications, four additional variables representing care quality—medication adherence and completion of the three monitoring tests—were included as covariates.

Analyses

First, we described the characteristics of the study sample, comprising patients newly diagnosed with hypertension in 2010, categorized by disability status and further subdivided by disability severity and type. Next, year-stratified logistic regression analyses was performed to estimate odds ratios (ORs) and 95% confidence intervals (CIs), examining the association between disability status and four indicators of hypertension care quality from 2011 to 2019. Separate models were constructed for disability status (disabled vs. non-disabled), disability severity (mild, severe, vs. non-disabled), and disability type (mobility, communication, mental, and others vs. non-disabled), both with and without adjustment for sociodemographic covariates.

To investigate the association between disability and the incidence of hypertension-related complications, we followed a cohort of patients newly diagnosed with hypertension who were free of complications at baseline through 2019 and estimated the hazard ratios (HRs) using a Cox proportional hazards model. These analyses were repeated for each type of complication, with and without adjustment for covariates, including care quality indicators.

Finally, subgroup analyses were performed to examine whether the association between disability status and the incidence of the four hypertension-related complications varied across age, income, and residential area. All ORs and HRs are presented in forest plots and tables. Statistical analyses were performed using SAS software version 9.4 (SAS Institute Inc., Cary, NC, USA).

Ethics statement

The requirement for ethical review and approval for this study was waived by the Samsung Medical Center Institutional Review Board because it was a secondary data analysis of anonymous samples that did not include any information by which the survey participants could be identified. Requirement for informed consent was waived because of the retrospective nature of the study (SMC202005065).

RESULTS

Among hypertensive patients with disabilities, approximately 61.6% were classified as having a mild form of disability (**Table 1**). The most common type of disability was mobility–related, accounting for 55.2% of cases, followed by communication-related disabilities at 22.2%. Hypertensive patients with disabilities were slightly younger and had lower income levels compared to those without disabilities (**Table 1**). Among hypertensive patients with disabilities, those with mental disabilities were significantly younger, with an average age of 50.9 years, whereas the average age among those with other types of disabilities was over 60 years (**Supplementary Table 3**). Furthermore, this group was the most economically vulnerable, with 68.4% receiving Medical Aid, compared to 14.2% to 28.8% among individuals with other types of disabilities.

Table 1. Characteristics of study sample: hypertensive patients newly diagnosed in 2010

Variables	Non-disability group	Disability group	*P* value
Total	47,564	52,743	
Disability severity			NA
Mild	NA	32,488 (61.6)	
Severe	NA	20,255 (38.4)	
Disability type			NA
Mobility disability	NA	29,131 (55.2)	
Communication disability	NA	11,727 (22.2)	
Psychiatric disability	NA	1,658 (3.1)	
Others	NA	10,227 (19.4)	
Sex			0.002
Male	27,015 (56.8)	30,471 (57.8)	
Female	20,549 (43.2)	22,272 (42.2)	
Age	63.6 ± 11.9	61.8 ± 12.7	< 0.001
Age group: 20-yr intervals			< 0.001
20–39	1,214 (2.6)	2,342 (4.4)	
40–64	21,955 (46.2)	26,377 (50.0)	
65–74	15,535 (32.7)	15,351 (29.1)	
75-	8,860 (18.6)	8,673 (16.4)	
Income level			< 0.001
Medical Aid	2,559 (5.4)	10,105 (19.2)	
Q1 (the lowest)	8,308 (17.5)	8,920 (16.9)	
Q2	8,300 (17.5)	8,431 (16.0)	
Q3	11,182 (23.5)	10,710 (20.3)	
Q4 (the highest)	17,215 (36.2)	14,577 (27.6)	
Residence area			< 0.001
Urban	20,415 (42.9)	20,654 (39.2)	
Rural	27,149 (57.1)	32,089 (60.8)	

Values are presented as number (%) or mean ± standard deviation.
NA = not applicable.

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Association between disability and quality of hypertension care

After adjusting for sociodemographic factors, hypertensive patients with disabilities were consistently less likely to achieve an MPR of ≥ 80% compared to those without disabilities across all study years (**Fig. 1**). The adjusted ORs (aORs) (95% CIs) ranged from 0.90 (0.87–0.94) to 0.96 (0.92–1.00), depending on the year (**Supplementary Table 4**). Conversely, hypertensive patients with disabilities were more likely than their counterparts without disabilities to undergo essential monitoring tests for complications at least once annually. Specifically, the aORs (95% CIs) for completing these tests ranged from 1.26 (1.22–1.30) to 1.32 (1.29–1.36) for blood tests, 1.22 (1.19–1.26) to 1.29 (1.25–1.32) for urine tests, and 1.30 (1.26–1.34) to 1.37 (1.33–1.40) for ECGs, depending on the year (**Fig. 1**, **Supplementary Table 4**).

The reduced medication adherence and increased likelihood of completing complication monitoring tests, compared to individuals without disabilities, were observed in both mild and severe disability groups (**Supplementary Fig. 2**, **Supplementary Table 5**). Notably, the ORs for medication adherence and receipt of blood tests did not consistently differ by disability severity. However, individuals with mild disabilities consistently showed higher odds of receiving urine tests, while those with severe disabilities consistently had higher odds of undergoing ECGs throughout the study period.

The quality of hypertension care varied according to disability type (**Fig. 2**, **Supplementary Table 6**). Hypertensive patients with mobility- and communication-related disabilities were consistently less likely to achieve an MPR of ≥ 80% compared to those without disabilities across all study years (**Supplementary Table 6**). Among hypertensive patients with mental disabilities, medication adherence was initially comparable to that of non-disabled individuals following their diagnosis in 2010 (aOR, 1.07; 95% CI, 1.01–1.13); however,

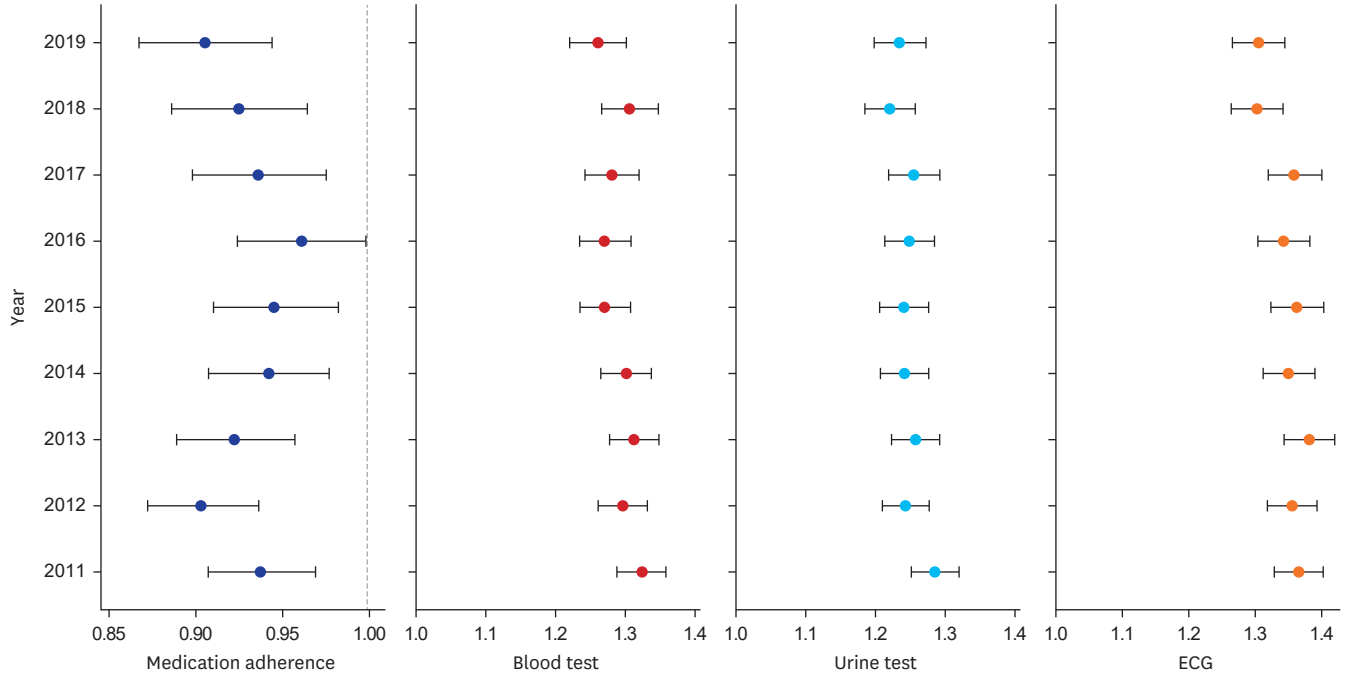

Fig. 1. Temporal trends in the odds ratio for achieving Medication Possession Ratio ≥ 80%, and for *undergoing* at least annual completion of three types of diagnostic tests (a blood test, a urine test, and an ECG) between 2011 and 2019, among patients newly diagnosed with hypertension in 2010, comparing those with disabilities to those without. Estimates are from analyses adjusted for age, sex, income-level, residence area (see **Supplementary Table 4** for details).
ECG = electrocardiogram.

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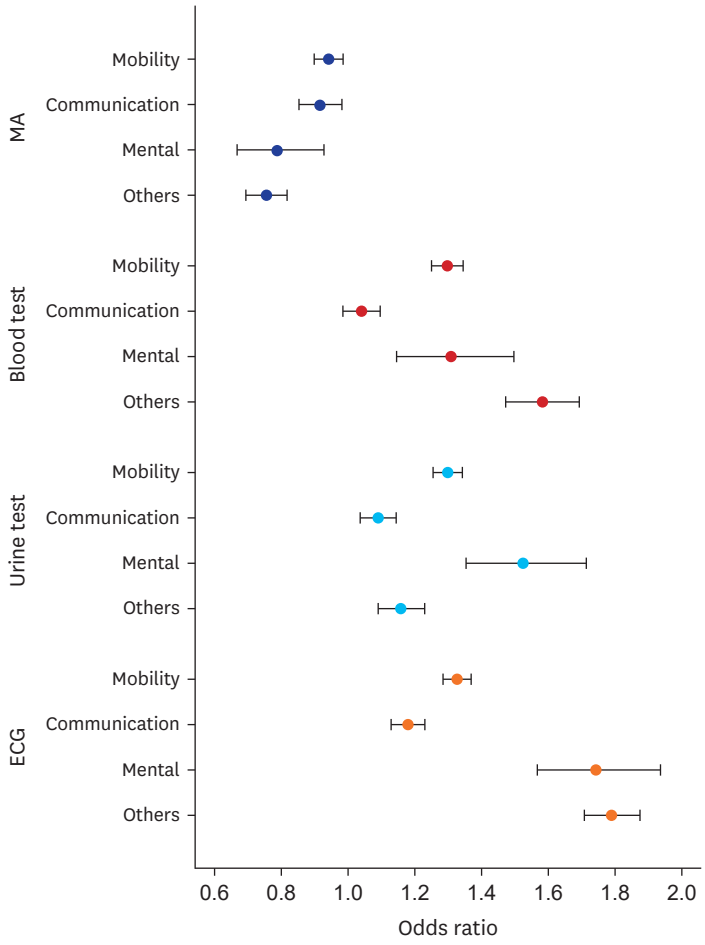

Fig. 2. Association between various disability types and quality of care (medication adherence and completion of three complication monitoring tests) in 2019 (see **Supplementary Table 6** for details).
MA = medication adherence, ECG = electrocardiogram.

it gradually declined over time, and from 2017 onward, the odds became the lowest among all disability types (e.g., aOR, 0.99; 95% CI, 0.92–1.08 in 2017). The likelihood of completing annual monitoring tests for complications was higher among individuals with disabilities than among those without disabilities throughout all years, regardless of disability type. Hypertensive patients with mental disabilities and those classified under "others" (primarily individuals with internal organ impairments) exhibited the highest odds of undergoing essential complication monitoring tests (**Supplementary Table 6**).

Association between disabilities and incidence of hypertension-related complications

Hypertension-related complications were more likely to occur among hypertensive patients with disabilities compared to those without disabilities in both crude and fully adjusted analyses (**Fig. 3** and **Supplementary Table 7**). Specifically, the adjusted HRs (95% CIs) for all-cause mortality was 1.52 (1.48–1.56); for cerebrovascular complications, 1.39 (1.33–1.45); for kidney complications, 1.53 (1.45–1.61); and for CV complications, 1.36 (1.31–1.41). Full adjustment for sociodemographic characteristics and care quality indicators resulted in only minimal attenuation of the HRs compared to the unadjusted analyses.

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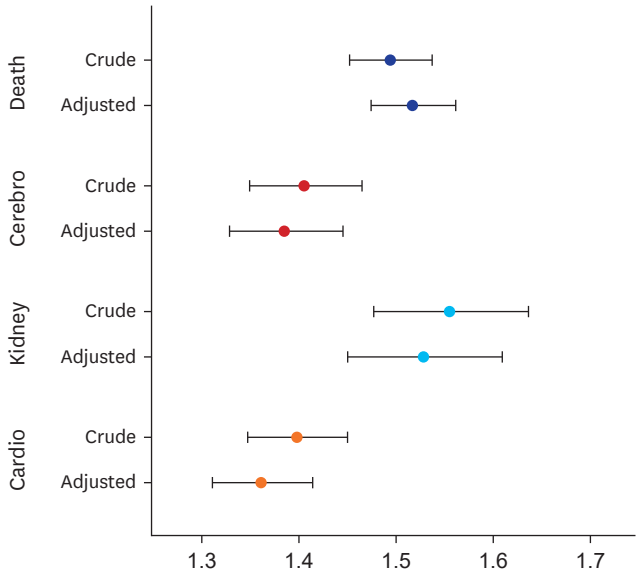

Fig. 3. Hazard ratios for hypertension-related complications and all-cause mortality among hypertensive patients with disabilities, compared to those without disabilities. Adjusted models account for age, sex, income-level, area of residence, Medication Possession Ratio, and completion of blood tests, urine tests, and electrocardiograms (see **Supplementary Table 7** for details).

Hypertensive patients with severe disabilities exhibited a higher risk of experiencing complications compared to those with mild disabilities (**Supplementary Table 7**). For instance, the risk of developing kidney diseases was 1.93 times higher (95% CI, 1.80–2.60) among hypertensive patients with severe disabilities, and 1.36 times higher (95% CI, 1.28–1.44) among those with mild disabilities, compared to their non-disabled counterparts. Among the four categories, hypertensive patients with disabilities classified as "others" were the most likely to experience hypertension-related complications (**Supplementary Table 7**).

Subgroup analyses revealed that the increased risk of hypertension-related complications associated with disabilities was more pronounced in the < 65-year-old group compared to ≥ 65-years-old group and among individuals living in urban areas compared to those in rural areas (**Supplementary Fig. 3** and **Supplementary Table 8**).

DISCUSSION

To our knowledge, this study is the first to comprehensively examine the associations between disability status—including its severity and types—and the quality of hypertension care, as well as the associations between disability status and the incidence of hypertension-related complications. Additionally, we conducted subgroup analyses to explore how these associations vary across different sociodemographic groups. Our analyses yielded several notable findings.

First, we observed lower medication adherence, which is well established variable associated with CV outcomes,[29-31] among hypertensive patients with disabilities. Several factors at multiple levels contribute to suboptimal medication adherence. At the patient level, barriers such as poor health literacy and complex medication regimens hinder adherence. Physician-level factors include ineffective communication regarding diseases and medication. At the

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healthcare system level, limited access to healthcare services and lack of advanced health information technology impede optimal adherence.[32] Studies have shown that individuals with disabilities encounter all these challenges more frequently, increasing their risk of suboptimal medication adherence. Specifically, they often bear a higher burden of multimorbidity compared to the general population, necessitating more complex regimens.[33] Also, communication barriers between patients and healthcare providers, especially for those with speech, hearing, brain, or intellectual impairments, often lead to insufficient understanding of dosage and administration.[34-37] This reduces awareness of health risks and belief in the benefits of medication adherence, thereby lowering their willingness to follow medication protocols.

One notable finding is the steady decline in medication adherence after the initial diagnosis of hypertension among individuals with mental disabilities (**Supplementary Table 6**). Although the exact mechanisms underlying this trend warrant further investigation, it is likely that impairment in cognitive function from exacerbations or repeated relapses of psychiatric episodes partly contributes to the gradual decline in adherence. Additionally, drug–drug interactions between psychiatric medications and antihypertensive agents have been reported to exacerbate side effects, potentially further reducing adherence.[38-40] An integrated care model for managing both mental illnesses and chronic diseases such as hypertension is needed.

Second, interestingly, our findings revealed that patients with disabilities were more likely to undergo essential monitoring tests at the recommended frequency. Previous research on the utilization of screening tests among individuals with disabilities has produced mixed results. For example, Shireman et al.[17] found that diabetes mellitus (DM) patients with developmental disabilities enrolled in the Kansas Medicaid program were screened for DM complications less frequently than the average for all Medicaid enrollees. Similarly, studies by Diab et al.,[41] Shin et al.,[42] and Shin et al.[20] reported lower rates of cervical and breast cancer screenings, among women with disabilities compared to women without disabilities, in the United States and Korea, respectively. In contrast, Reichard et al.[18] found that DM patients with physical disabilities enrolled in the Kansas Medicaid program underwent HbA1C tests, eye examinations, and primary care visits at higher rates than the national averages for all Medicaid recipients.

While the higher adherence to recommended frequency of monitoring tests among individuals with disabilities in our study can be primarily attributed to their greater overall healthcare needs, an additional contextual factor in Korea warrants consideration. Most primary care clinics in Korea lack the necessary infrastructure and specialized personnel to accommodate the complex needs of individuals with disabilities. Consequently, despite hospitals being geographically less accessible, individuals with disabilities tend to seek care more frequently at hospital-level institutions, where diagnostic tests are administered more systematically and comprehensively.[43]

Although there is a need for further research in this area, the differing associations between disability severity and adherence to recommended frequency of monitoring test by test type (**Supplementary Fig. 2**) likely reflects a complex interplay of healthcare utilization pathways, actual medical needs, and healthcare coverage. Individuals with mild disabilities might be more likely to access general primary care settings, where relatively simple tests– such as urine and blood tests– can be performed with minimal assistance. These tests may be

conducted not solely for the purpose of hypertension complication monitoring, but also as part of broader health assessments. In contrast, individuals with severe disabilities are more likely to rely on tertiary hospitals, where tests requiring additional assistance—such as ECGs—are more readily available.[44] Additionally, unlike blood or urine tests, ECGs are more strictly reimbursed only when medically necessary—such as in the presence of CV risk, symptoms or suspected complications—and are not generally covered for routine screening in low-risk asymptomatic patients.[45] Therefore, ECGs may be more proactively used in patients with severe disabilities, who are more likely to be classified as high-risk.

The observed variation in adherence to recommended frequency of monitoring test by disability types may also relate to the type of medical institutions individuals with different disabilities tend to utilize. According to the 2023 Survey on the Living Conditions of Persons with Disabilities,[46] the proportion of individuals with disabilities who reported the use of general or tertiary hospitals for routine care was highest among those with internal organ impairments—ranging from 59% for those with renal failure to 95% for those with liver disease—followed by those with mental disabilities (32% for individuals with intellectual disabilities and 45% for those with autism-related disabilities). Individuals with communication-related disabilities (e.g., hearing impairments and facial deformities) and those with mobility-related disabilities reported lower rates of hospital-level service utilization, approximately at 28–30%. This pattern closely mirrors the likelihood of undergoing monitoring tests observed in our analyses (**Fig. 2**, **Supplementary Table 6**).

Third, although hypertensive patients with disabilities underwent screening tests for complications at higher rates, they exhibited a higher risk of hypertension-related complications compared to individuals without disabilities, particularly among those with mental disabilities or with disabilities classified under "others." This elevated risk remained significant even after adjusting for medication adherence and compliance with recommended monitoring tests, suggesting that factors not explored in our analyses may contribute to the incidence of complications among hypertensive patients with disabilities. One plausible explanation is the greater difficulty individuals with disabilities face in engaging in physical activities. Previous studies have reported a higher prevalence of reduced muscle mass (*sarcopenia*), often resulting from physical inactivity, among individuals with disabilities, which can increase CV risk by promoting fat accumulation and inflammation.[19,47] Our findings reiterate that better adherence to monitoring guidelines may be of limited value if it is not accompanied by corresponding follow-up care based on the test results.

Finally, subgroup analyses revealed that the increased risk of hypertension-related complications associated with disabilities was more evident in younger age groups and urban settings. The less pronounced impact of disability on complication risk in older age groups may be attributed to the higher baseline risk associated with age-related physical frailty, which may diminish the relative contribution of disability to complication risk. Similarly, the smaller disparity in complication risk between patients with and without disabilities in rural areas might be explained by the general lack of access to resources such as infrastructure supporting physical activities and healthcare services. This lack of access may limit opportunities for preventing complications for all individuals, regardless of disability status. In contrast, urban environments provide more resources, but these are often more readily accessible to individuals without disabilities, potentially exacerbating disparities in health outcomes.

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Our findings underscore the critical need for comprehensive strategies to ensure effective long-term hypertension care for individuals with disabilities. First, a multi-level approach is required to enhance medication adherence in this population. Caring for individuals with disabilities demands significant time and effort from healthcare providers. However, Korea's current fee-for-service provider payment mechanism fails to adequately compensate providers for the additional time and attention required for their care. Tailored technical support is also needed to improve medication adherence for patients with disabilities. For example, making medication labels more legible by using enlarged text or providing braille labels could be highly beneficial for individuals with vision impairments. Similarly, using simplified instructions or pictorial explanations may aid those with intellectual disabilities. Second, the current guidelines recommending annual diagnostic screening tests for complications need to be re-evaluated for their adequacy in detecting early signs of complications among individuals with disabilities, given the greater challenges faced by individuals with disabilities in maintaining normal blood pressure levels effectively in their daily lives.[48-50] Lastly, our analysis suggests that within the disability population, young adults are at higher risk of developing hypertension-related complications than the older individuals, underscoring the need for increased attention.

This study has several limitations. First, while disability is a broad and multifaceted concept, the definition of disability used in NDR is based solely on medical criteria established for administrative purposes. Second, our study population was restricted to individuals diagnosed with hypertension at health facilities, potentially introducing selection bias and leading to an underestimation of hypertension-related complications. Third, the inclusion of sociodemographic characteristics and comorbidities in the analyses was constrained by the availability of relevant variables in the NHI database. Additionally, factors that may influence the prescription patterns (e.g., refill intervals)—such as insurance coverage type which could affect medication adherence—were not be accounted for in this study.

Medication adherence was lower, but completion rates of monitoring screenings were higher among hypertensive patients with disabilities compared to those without disabilities. The risk of hypertension-related complications was significantly greater among hypertensive patients with disabilities, even after adjusting for care quality indicators. Notably, the increased risk of complications associated with disabilities was more pronounced in younger age groups. Comprehensive interventions aimed at enhancing the quality of hypertension care among individuals with disabilities are needed. Additionally, further research is warranted to identify and better understand other factors contributing to the elevated risk of hypertension-related complications in this population.

SUPPLEMENTARY MATERIALS

Supplementary Methods

Supplementary Table 1
ICD-10 codes of hypertension-related complications

Supplementary Table 2
Classification of disabilities

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Supplementary Table 3
Sociodemographic characteristics by disability severity and type among newly diagnosed hypertensive patients in 2010 (N, %)

Supplementary Table 4
Association between disability and medication adherence and completion of essential monitoring tests among hypertensive patients from 2011 to 2019

Supplementary Table 5
Trends in odds ratios (95% confidence interval) for medication adherence and completion of essential monitoring tests by disability severity

Supplementary Table 6
Trends in odds ratios (95% confidence interval) for medication adherence and completion of essential monitoring tests by disability type

Supplementary Table 7
Hazard ratios (95% confidence intervals) for the incidence of hypertension-related complications among hypertensive patients with disabilities

Supplementary Table 8
Adjusted hazard ratios (95% confidence intervals) for the incidence of hypertension-related complications among hypertensive patients with disabilities in age-, income- and residence - stratified subgroups

Supplementary Fig. 1
Study sample derivation process: 2010 newly-diagnosed hypertensive patients without complications.

Supplementary Fig. 2
Temporal trend of gap in ORs of hypertensive patients with mild and severe disabilities for hypertension management quality between 2011 and 2019 (detailed in **Supplementary Table 5**).

Supplementary Fig. 3
Hazard ratios of 2010 newly diagnosed hypertensive patients with disabilities for incidence of hypertension-related complications and all-cause mortality compared to hypertensive patients without disabilities in crude and adjusted models (Crude: non-adjusted, adjusted: age, sex, income-level, residence place, MPR, blood test, urine test, and EGC) (detailed in **Supplementary Table 8**).

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