



## Original Article

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# Sociodemographic Factors Related to Lower Urinary Tract Symptoms in Men: A Korean Community Health Survey

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**Purpose:** This study estimated the prevalence of lower urinary tract symptoms (LUTS) in Korean men and the conditions for being diagnosed with or treated for LUTS/benign prostatic hyperplasia (BPH).

**Methods:** We analyzed cross-sectional data collected from 69,851 Korean men who were 40 years of age or older and had participated in the Korean Community Health Survey performed in 2011. Interviewers performed face-to-face surveys that included sociodemographic questions, the International Prostate Symptom Score (IPSS), and questions regarding whether the subjects had been diagnosed with or treated for LUTS/BPH. We estimated the prevalence of LUTS and assessed whether the subjects had been diagnosed with or treated for LUTS/BPH.

**Results:** Moderate to severe LUTS, storage symptoms, and voiding symptoms increased with age. The IPSS quality of life score was  $1.5 \pm 0.004$  in the mild LUTS group ( $n = 57,701$ ),  $3.3 \pm 0.01$  in the moderate LUTS group ( $n = 9,203$ ), and  $4.3 \pm 0.02$  in the severe LUTS group ( $n = 2,947$ ) ( $P < 0.0001$ ). The prevalence of moderate to severe LUTS in those who had not been diagnosed with LUTS/BPH was 64.5% (7,847 of 12,150), and the prevalence of moderate to severe LUTS in those who had been diagnosed with LUTS/BPH but had not been treated was 23.5% (2,853 of 12,150).

**Conclusions:** The severity of LUTS in Korean men increased with age, and the IPSS quality of life score increased with the severity of LUTS. Many Korean men with moderate to severe LUTS had not been diagnosed or treated for LUTS/BPH. Socio-economic conditions played an important role in health-seeking behavior among patients with LUTS/BPH.


**Keywords:** Lower Urinary Tract Symptoms; Health Surveys

- **Research Ethics:** This study was approved by the Institutional Review Board of Hanyang University Guri Hospital (approval number: 2011-05CON-04-C).
- **Conflict of Interest:** No potential conflict of interest relevant to this article was reported.

## INTRODUCTION

Lower urinary tract symptoms (LUTS) are common among men and affect more than half of the male population. Consequently, billions of dollars are spent annually to control and treat these symptoms [1,2]. While the prevalence of moderate to severe LUTS varies according to the population and age

group, roughly 20% of all patients with LUTS report moderate to severe symptoms, including voiding and storage symptoms that can impact quality of life (QoL). Furthermore, LUTS has commonly been associated with a variety of other health conditions [3-7] and has been considered to be a risk factor for benign prostatic hyperplasia (BPH) progression, along with age, low maximum urinary flow rate, and high postvoid residual

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urine volume [8,9]. However, in epidemiologic studies, the incidence and prevalence of LUTS have been found to vary due to the differing definitions of LUTS and the associated risk factors in patient-reported results. Although men may have LUTS, they may not seek or find medical care for treatment. In a survey conducted in the United Kingdom (UK) to assess the prevalence of LUTS, only 41% of men with moderate to severe LUTS were found to exhibit health-seeking behavior, and only 18% of men had been diagnosed with BPH [10].

In the Boston Area Community Health Survey, the prevalence of moderate to severe LUTS was reported as 19.3% [4]. The authors of the study also suggested that metabolic syndrome was associated with the severity of LUTS. In other epidemiologic surveys, the prostatic volume was found to be strongly associated with symptom aggravation and was found to increase the risk of urinary retention, which can lead to treatment and surgery for BPH [11,12].

Several clinical guidelines have suggested optimal criteria for managing patients with LUTS/BPH [13-15]. However, treatment differs according to ethnic characteristics and, thus, these guidelines cannot be applied broadly. Asian men generally have lower prostatic volumes and relatively lower serum prostate-specific antigen levels than Western men, but a similar incidence of LUTS has been observed in both populations [16,17].

The aim of this study was to estimate the prevalence of LUTS in the Korean population and to investigate whether those with symptoms had been diagnosed with or treated for LUTS/BPH.

We conducted a nationwide survey to achieve this aim and to make progress towards defining practical clinical objectives for patients with LUTS/BPH.

## MATERIALS AND METHODS

### 1. Study Group

This study was approved by the Institutional Review Board of Hanyang University Guri Hospital (approval number: 2011-05CON-04-C). Data were collected from August 2011 to October 2011 through the Korean Community Health Survey (KCHS), a nationwide health interview survey conducted in Korea by the Korea Centers for Disease Control and Prevention in order to estimate patterns of disease prevalence and morbidity among Korean adults. The target population included all Korean residents  $\geq 19$  years old in the area at the time of the survey. However, because it was not possible to interview all residents  $\geq 19$  years old, the survey population was based on registered residents only. *Tong Ban/Lee* (the smallest administrative district units) were selected as the primary sampling unit of housing types, with an average of 5 households selected per unit. The primary sampling unit was selected through probability proportionate sampling and households were systematically sampled to reduce bias. Face-to-face surveys were conducted by trained interviewers and included sociodemographic questions, the International Prostate Symptom Score (IPSS), and questions regarding whether the subjects had been diagnosed with

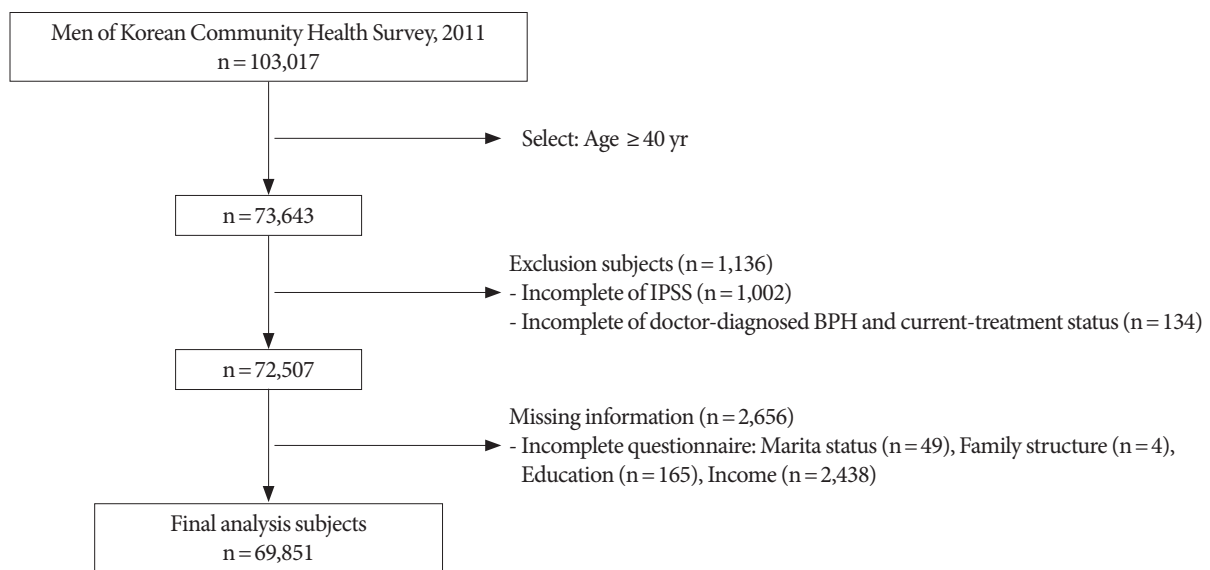


Fig. 1. Korean Community Health Survey participation flowchart. IPSS, International Prostate Symptom Score.

or treated for LUTS/BPH.

A total of 103,017 men participated in the survey. We selected men for our analysis who were ≥40 years old from this sample. We excluded subjects with incomplete questionnaires (n=1,002) and subjects who had uncertain medical histories regarding doctor-diagnosed BPH or current treatment status (n=134). We also excluded patients with incomplete sociodemographic information (n=2,656) (Fig. 1).

We assessed age, marital status, family structure, education, income, and place of residence for the entire cohort. The severity of LUTS was stratified according to IPSS as follows: mild (IPSS <8), moderate (8 ≤ IPSS <20), and severe (20 ≤ IPSS <36). Men without LUTS were considered to be part of the mild group. We analyzed LUTS based on storage and voiding symptoms. Doctor-diagnosed BPH and treatment status were self-reported and stratified as follows: not diagnosed, doctor-diagnosed but not currently on treatment for BPH, and doctor-diagnosed and currently on treatment for BPH.

## 2. Statistical Analysis

The KCHS data were subjected to a complex sampling design and were analyzed with stratum variance estimates, stratification variables, and sampling weights using the *proc survey* command in SAS. The IPSS scores were expressed as the mean ± standard deviation, and distributions were shown as percentages. The prevalence of LUTS was weighted and adjusted for age by direct age standardization in order to approximate the age distribution of the national population. Prevalence estimates were based on 2005 census data that was collected by the Korea National Statistical Office

Categorical variables were analyzed with the chi-square test or Cochran-Mantel-Haenszel test and continuous variables were analyzed with a general linear model. In all analyses, the adjusted age, P-value and P for trend are presented. Statistical analyses of the associations between the severity of LUTS and sociodemographic characteristics were conducted using multivariable logistic regression models, and the weighted prevalence and age-adjusted prevalence of LUTS were stratified according to IPSS. P values less than .05 were considered statistically significant. All data were analyzed using SAS 9.4 (SAS Inc., Cary, NC, USA).

## RESULTS

We collected and analyzed data from 69,851 of the 103,017

men, including those who were ≥40 years old and excluding 33,166 subjects due to age, insufficient information on sociodemographic characteristics, or incomplete questionnaires. The sociodemographic characteristics at baseline for the 69,851 men are presented in Table 1.

Table 2 shows the prevalence rates of LUTS by severity according to age and BPH. The prevalence of moderate to severe LUTS (based on both storage and voiding symptoms) was high, which correlated with increasing age (Figs. 2, 3). The IPSS-QoL score was 1.5 ± 0.004 in the mild LUTS group (n=57,701), 3.3 ± 0.01 in the moderate LUTS group (n=9,203), and 4.3 ± 0.02 in the severe LUTS group (n=2,947) (P < 0.0001). The prevalence

**Table 1.** Sociodemographic characteristics (Korean Community Health Survey, 2011) (n=69,851)

Variable	No. (%)
Age (yr)	
40–49	20,794 (29.8)
50–59	19,637 (28.1)
60–69	15,533 (22.2)
≥70	13,887 (19.9)
Marital status <sup>a)</sup>	
With spouse	60,153 (86.1)
Separated	2,339 (3.4)
Divorced	2,515 (3.6)
Widowed	2,394 (3.4)
Never married	2,450 (3.5)
Family structure	
1 Generation	30,664 (43.9)
2 Generation	32,552 (46.6)
3 Generation	6,635 (9.5)
Education	
College or more	16,208 (23.2)
High school	24,174 (34.6)
Middle school	11,360 (16.3)
Elementary school	13,457 (19.3)
Noneducated	4,652 (6.7)
Income (KRW 10,000/mo)	
≥401	13,261 (19.0)
301–400	6,986 (10.0)
201–300	12,420 (17.8)
101–200	14,706 (21.1)
≤100	19,689 (28.2)
Unknown	2,789 (4.0)
Dwelling place	
County, <50,000 population	26,492 (37.9)
Small city, ≥50,000 population	19,773 (28.3)
Middle city, ≥500,000 population	6,110 (8.8)
Metropolitan, ≥1,000,000 population	17,476 (25.0)

KRW, Korean won.

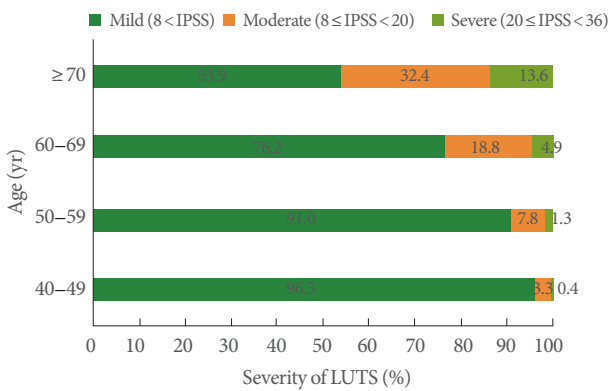
<sup>a)</sup>Include common-law marriage.

**Table 2.** LUTS prevalence and severity according to age and BPH

Variable	IPSS score Mean ± SD	LUTS severity						P-value <sup>b)</sup>
		Mild (8 < IPSS) (n = 57,701)		Moderate (8 ≤ IPSS < 20) (n = 9,203)		Severe (20 ≤ IPSS < 36) (n = 2,947)		
		No. (%) <sup>a)</sup>	SE	No. (%) <sup>a)</sup>	SE	No. (%) <sup>a)</sup>	SE	
Total (men)	3.9 ± 6.34	57,701 (86.9)	0.20	9,203 (10.3)	0.10	2,947 (2.8)	0.10	
Age (yr)								
40–49	1.3 ± 2.86	20,081 (96.6)	0.17	628 (3.0)	0.17	85 (0.4)	0.06	< 0.0001
50–59	2.4 ± 4.23	17,915 (91.3)	0.28	1,463 (7.5)	0.26	259 (1.3)	0.11	
60–69	4.9 ± 6.51	11,997 (77.2)	0.50	2,801 (18.0)	0.45	735 (4.7)	0.26	
≥ 70	8.9 ± 8.76	7,708 (55.5)	0.63	4,311 (31.0)	0.59	1,868 (13.4)	0.44	
Self-reported doctor diagnosed BPH and treatment status <sup>c)</sup>								
Nondoctor diagnosed BPH (n = 62,090)	3.0 ± 5.12	54,243 (87.4)	0.20	6,439 (10.4)	0.10	1,408 (2.3)	0.10	< 0.0001
Doctor diagnosed but noncurrent treatment BPH (n = 4,454)	13.1 ± 9.87	1,601 (35.9)	2.90	1,709 (38.4)	2.80	1,144 (25.7)	2.00	
Doctor diagnosed and current treatment BPH (n = 3,307)	8.7 ± 8.45	1,857 (56.2)	1.30	1,055 (31.9)	1.30	395 (11.9)	0.60	

LUTS, lower urinary tract symptoms; BPH, benign prostate hyperplasia; IPSS, International Prostate Symptom Score; SD, standard deviation; SE, standard error.

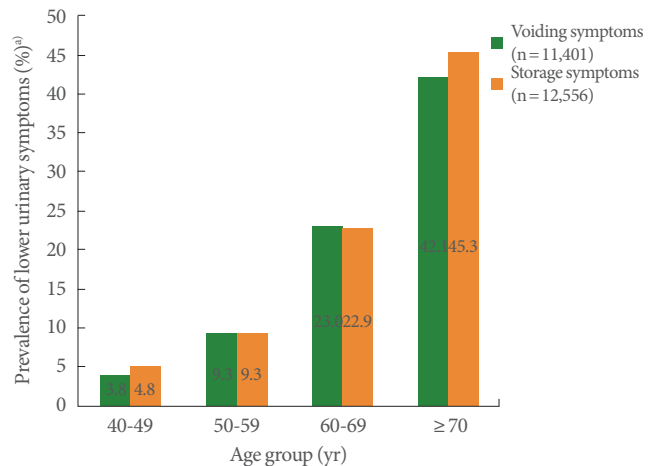
<sup>a)</sup>The prevalence of lower urinary tract symptom (or voiding/storage symptoms) was estimated from the percentage of subjects reporting lower urinary tract symptom (or voiding/storage symptoms) after weighting for age to approximate the national population in terms of age as defined by the 2005 census performed by the Korean National Statistical Office. <sup>b)</sup>P-values were calculated using the chi-square test and Cochran-Mantel-Haenszel test for categorical variables. <sup>c)</sup>Values were age (categorical variable: units of 10 years)-adjusted.



**Fig. 2.** Severity of lower urinary tract symptoms (LUTS) according to age group. IPSS, International Prostate Symptom Score.

of moderate to severe LUTS in those who had not been not diagnosed with LUTS/BPH was 64.5% (7,847 of 12,150), and the prevalence of moderate to severe LUTS in those who had been diagnosed with LUTS/BPH but had not been treated was 23.5% (2,853 of 12,150).

QoL was affected by the severity of LUTS (Table 3) and was associated with both voiding and storage symptoms. We also found that the severity of LUTS was associated with sociode-



**Fig. 3.** Voiding and storage symptoms according to age group. <sup>a)</sup>Estimated percentage from subject reporting.

mographic characteristics (Table 4). Marital status, family structure, educational status, monthly income, and regional scales were associated with the prevalence of LUTS and with both voiding symptoms (P < 0.0001, P = 0.1299, P < 0.0001, P < 0.0001, P < 0.0001, respectively) and storage symptoms (P < 0.0001, P < 0.0001, P < 0.0001, P = 0.0006, respectively).

**Table 3.** IPSS-quality of life score according to the prevalence and LUTS severity

Variable	LUTS severity			Voiding symptoms <sup>b)</sup>		Storage symptoms <sup>c)</sup>		
	Total (n = 69,851)	Mild (8 < IPSS) (n = 57,701)	Moderate (8 ≤ IPSS < 20) (n = 9,203)	Severe (20 ≤ IPSS < 36) (n = 2,947)	Not-voiding symptoms (n = 58,450)	Voiding symptoms (n = 11,401)	Not-storage symptoms (n = 57,295)	Storage symptoms (n = 12,556)
IPSS-quality of life <sup>a)</sup> (1 score/total score)	1.89 ± 1.41	1.5 ± 1.11	3.5 ± 0.99	4.6 ± 0.84	1.5 ± 1.14	3.8 ± 1.10	1.5 ± 1.14	3.6 ± 1.26
				< 0.0001				< 0.0001
								< 0.0001

Value are presented as mean ± standard deviation.

IPSS, International Prostate Symptom Score; LUTS, lower urinary tract symptoms.

<sup>a)</sup>The IPSS-quality of life consists of scoring the patients on their response to the question “If you were to spend the rest of your life with your urinary condition the way it is now, how would you feel about that?” on a scale of 0 (delighted) to 6 (terrible). <sup>b)</sup>Voiding symptoms if the sum of the score on American Urological Association Symptom Index (AUA-SI) items 1, 3, 5 and 6 was 5 or greater. <sup>c)</sup>Storage symptoms if the sum of the score on AUA-SI items 2, 4 and 7 was 4 or greater. <sup>d)</sup>P-values were calculated using one way analysis of variance and independent t-test for continuous variables.

In multivariable logistic regression analysis, we found that age, marital status, family structure, educational status, income, place of residence, and QoL had a statistically significant association with the severity of LUTS (Table 5). Furthermore, we analyzed the crude model, the age-adjusted model, and the model that incorporated age adjustment, doctor-diagnosed BPH, and treatment status. In these models, all of the aforementioned variables were found to be correlated with the severity of LUTS (all P < 0.0001).

## DISCUSSION

This prospective study provides insight into the prevalence of LUTS/BPH and the pattern of treatment for LUTS/BPH in Korea. Our findings expand on the results of previous epidemiologic studies for LUTS/BPH that showed that the prevalence of LUTS increased linearly with age [18-20]. Moreover, the severity of LUTS was associated with treatment patterns for LUTS/BPH.

This study assessed the predictors of LUTS/BPH diagnosis in the general population. Younger men with higher education levels and higher income may have had relatively easier access to care, and were, therefore, more likely to have been diagnosed with LUTS. Additionally, symptom severity and the impact on QoL increased when other socioeconomic conditions were present. Several previous surveys in Korea reported that the severity of LUTS was correlated with age [21, 22]. In a previous study, the rate of health-seeking behavior for LUTS was also observed to increase with age in the Korean population [23]. In our survey, we found that the rate of health-seeking behavior for LUTS increased with the severity of LUTS (based on storage and voiding symptoms), and that the severity of LUTS increased with age.

Several studies have reported rates of urinary symptoms [10,23-26], and these studies have also indicated that increasing rates of LUTS correlate with increases in age. Some reports have found that men with LUTS did not seek any medical care. In our study, older men with lower education and lower income levels were more likely to have a higher severity of LUTS on diagnosis. It is possible that men that experience LUTS may perceive LUTS as a weakness and as a symptom of aging, and, thus, they may not seek help from a partner, family, or friends [27]. This may also lead to decreases in access to medical care, which could allow symptoms to progress. The results of our study indicated that lower income levels accelerated this phenomenon.

**Table 4.** LUTS severity and prevalence according to sociodemographic characteristics

Variable	Mild (IPSS < 8) (n = 57,701)			Moderate (8 ≤ IPSS < 20) (n = 9,203)			Severe (20 ≤ IPSS < 36) (n = 2,947)			P-value <sup>c)</sup>
	No.	Weighted prevalence rate %	Adjusted prevalence rate <sup>a)</sup> SE	No.	Weighted prevalence rate %	Adjusted prevalence rate <sup>a)</sup> SE	No.	Weighted prevalence rate %	Adjusted prevalence rate <sup>a)</sup> SE	
<b>Marital status</b>										
With spouse (n = 60,153)	49,905	(86.5)	0.2 (87.4)	7,820	(10.6)	0.2 (10.0)	2,428	(2.8)	0.1 (2.6)	<0.0001
Separated (n = 2,339)	2,006	(87.2)	0.9 (87.2)	261	(10.0)	0.8 (10.0)	72	(2.8)	0.5 (2.8)	
Divorced (n = 2,515)	2,127	(85.5)	1.0 (82.5)	303	(11.8)	0.9 (14.3)	85	(2.6)	0.4 (3.2)	
Widowed (n = 2,394)	1,435	(62.2)	1.4 (84.8)	650	(25.3)	1.3 (11.4)	309	(12.5)	1.0 (3.8)	
Never married (n = 2,450)	2,228	(90.7)	0.8 (81.6)	169	(7.2)	1.7 (12.7)	53	(2.0)	0.4 (5.7)	
P for trend <sup>b)</sup>						<0.0001				
<b>Family structures</b>										
1 Generation (n = 30,664)	22,802	(76.6)	0.3 (86.0)	5,814	(17.7)	0.3 (11.0)	2,048	(5.7)	0.2 (3.0)	<0.0001
2 Generation (n = 32,552)	29,330	(91.0)	0.2 (87.3)	2,598	(7.4)	0.2 (10.0)	624	(1.6)	0.1 (2.7)	
3 Generation (n = 6,635)	5,569	(85.3)	0.6 (86.8)	791	(11.2)	0.5 (10.3)	275	(3.6)	0.3 (2.9)	
P for trend <sup>b)</sup>						<0.0001				
<b>Educational status</b>										
College or more (n = 16,208)	14,961	(92.7)	0.3 (89.5)	1,052	(6.3)	0.2 (8.8)	195	(1.0)	0.1 (1.7)	<0.0001
High school (n = 24,174)	21,419	(89.5)	0.3 (87.7)	2,237	(8.6)	0.2 (9.9)	518	(1.9)	0.1 (2.4)	
Middle school (n = 11,360)	9,194	(81.6)	0.5 (84.7)	1,704	(14.6)	0.5 (12.3)	462	(3.8)	0.2 (3.0)	
Elementary school (n = 13,457)	9,446	(71.0)	0.6 (82.4)	2,902	(21.2)	0.5 (13.4)	1,109	(7.8)	0.3 (4.2)	
Noneducated (n = 4,652)	2,681	(57.1)	1.1 (78.0)	1,308	(28.2)	1.0 (16.1)	663	(14.8)	0.8 (5.9)	
P for trend <sup>b)</sup>						<0.0001				
<b>Monthly income (KRW)</b>										
≥ 401 (n = 13,261)	12,218	(92.8)	0.3 (88.3)	865	(6.3)	0.3 (9.5)	178	(0.9)	0.1 (2.2)	<0.0001
301–400 (n = 6,986)	6,411	(92.6)	0.4 (88.9)	486	(6.4)	0.4 (9.0)	89	(1.0)	0.1 (2.1)	
201–300 (n = 12,420)	11,173	(90.7)	0.3 (88.6)	1,040	(7.8)	0.3 (9.3)	207	(1.5)	0.1 (2.1)	
101–200 (n = 14,706)	12,217	(83.9)	0.4 (86.4)	1,986	(12.9)	0.4 (10.9)	503	(3.2)	0.2 (2.7)	
≤ 100 (n = 19,689)	13,272	(68.1)	0.5 (81.0)	4,540	(22.7)	0.4 (14.2)	1,877	(9.2)	0.3 (4.8)	
Unknown (n = 2,789)	2,410	(88.3)	0.8 (88.4)	286	(9.1)	0.7 (9.1)	93	(2.6)	0.4 (2.5)	
P for trend <sup>b)</sup>						<0.0001				
<b>Dwelling place</b>										
County (n = 26,492)	21,280	(83.4)	0.3 (88.0)	3,841	(12.4)	0.2 (9.2)	1,371	(4.2)	0.1 (2.8)	<0.0001
Small city (n = 19,773)	16,399	(86.0)	0.3 (86.8)	2,574	(10.8)	0.3 (10.3)	800	(3.1)	0.1 (2.9)	
Middle city (n = 6,110)	5,246	(87.4)	0.5 (86.7)	674	(9.9)	0.4 (10.4)	190	(2.7)	0.2 (2.9)	
Metropolitan (n = 17,476)	14,776	(86.4)	0.3 (86.6)	2,114	(10.8)	0.3 (10.6)	586	(2.8)	0.1 (2.8)	
P for trend <sup>b)</sup>						<0.0001				

LUTS, lower urinary tract symptoms; IPSS, International Prostate Symptom Score; SE, standard error; KRW, Korean won.  
<sup>a)</sup> Adjusted for age by direct standardization using 2005 Census as the standard population (categorical variable; units of 10 years). <sup>b)</sup> P for trend was calculated using the Cochran-Mantel-Haenszel test for categorical variables. <sup>c)</sup> P-values for the weighted prevalence of lower urinary tract symptom (or voiding/storage symptoms) using chi-square test for categorical variables. County, < 50,000 population; Small city, ≥ 50,000 population; Middle city, ≥ 500,000 population; Metropolitan, ≥ 1,000,000 population.

**Table 5.** Odds ratios (OR) and 95% confidence intervals (CIs) from multivariable logistic regression analysis of the relationship between LUTS severity and covariates in Korean adults, 19 years or older (Korean Community Health Survey, 2011)

Variable	LUTS severity					
	Crude model		Age-adjusted model		Adjusted model <sup>a)</sup>	
	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Age (yr)						
40–49	1.000	(Reference)				
50–59	2.702	(2.47–2.96)				
60–69	8.297	(7.63–9.02)				
≥70	23.046	(21.24–25.01)				
P-value	<0.0001					
P for trend	<0.0001					
Marital status						
With spouse	1.000	(Reference)	1.000	(Reference)	1.000	(Reference)
Separated	0.806	(0.72–0.91)	1.017	(0.90–1.15)	1.061	(0.93–1.21)
Divorced	0.886	(0.79–0.99)	1.715	(1.52–1.93)	1.764	(1.56–1.99)
Widowed	3.298	(3.04–3.58)	1.437	(1.32–1.57)	1.450	(1.33–1.59)
Never married	0.486	(0.42–0.56)	1.799	(1.55–2.09)	1.951	(1.68–2.27)
P-value	<0.0001		<0.0001		<0.0001	
P for trend	<0.0001		<0.0001		<0.0001	
Family structures						
1 Generation	1.000	(Reference)	1.000	(Reference)	1.000	(Reference)
2 Generation	0.317	(0.30–0.33)	0.906	(0.86–0.95)	0.937	(0.89–0.99)
3 Generation	0.557	(0.52–0.60)	0.992	(0.92–1.07)	1.009	(0.93–1.09)
P-value	<0.0001		0.0008		0.0401	
P for trend	<0.0001		0.0513		0.1542	
Education						
College or more	1.000	(Reference)	1.000	(Reference)	1.000	(Reference)
High school	1.545	(1.44–1.66)	1.234	(1.15–1.33)	1.267	(1.17–1.37)
Middle school	2.828	(2.63–3.05)	1.489	(1.38–1.61)	1.610	(1.48–1.75)
Elementary school	5.162	(4.82–5.53)	1.782	(1.65–1.92)	2.035	(1.88–2.20)
Noneducated	9.124	(8.42–9.89)	2.265	(2.07–2.48)	2.792	(2.55–3.06)
P-value	<0.0001		<0.0001		<0.0001	
P for trend	<0.0001		<0.0001		0.000	
Income (KRW/mo)						
≥401	1.000	(Reference)	1.000	(Reference)	1.000	(Reference)
301–400	1.049	(0.94–1.17)	1.029	(0.92–1.15)	1.081	(0.97–1.21)
201–300	1.305	(1.20–1.42)	1.026	(0.94–1.12)	1.071	(0.98–1.18)
101–200	2.383	(2.21–2.57)	1.274	(1.17–1.38)	1.299	(1.20–1.41)
≤100	5.758	(5.37–6.17)	1.727	(1.60–1.87)	1.862	(1.72–2.02)
Unknown	1.856	(1.64–2.10)	1.196	(1.05–1.37)	1.241	(1.08–1.42)
P-value	<0.0001		<0.0001		<0.0001	
P for trend	<0.0001		0.0448		0.0619	
Dwelling place						
County	1.000	(Reference)	1.000	(Reference)	1.000	(Reference)
Small city	0.836	(0.80–0.88)	1.190	(1.13–1.25)	1.165	(1.11–1.23)
Middle city	0.668	(0.62–0.72)	1.196	(1.10–1.30)	1.103	(1.01–1.20)
Metropolitan	0.74	(0.70–0.78)	1.148	(1.09–1.21)	1.079	(1.02–1.14)
P-value	<0.0001		<0.0001		<0.0001	
P for trend	<0.0001		0.000		0.0041	
IPSS-quality of life (1score/total score)	5.063	(4.94–5.19)	4.572	(4.46–4.69)	4.410	(4.30–4.53)
P for trend	<0.0001		<0.0001		<0.0001	

LUTS, lower urinary tract symptoms; IPSS, International Prostate Symptom Score; KRW, Korean won.

<sup>a)</sup>Adjusted for age (categorical variable: units of 10 years) and doctor diagnosed benign prostate hyperplasia (BPH) and treatment status (categorical variable: nondoctor diagnosed BPH, doctor diagnosed but noncurrent treatment BPH, doctor diagnosed and current treatment BPH).

A previous study also reported that age was associated with similar results and reported that the symptom rate and severity of LUTS increased with age [28].

Interestingly, the severity of LUTS was found to be directly associated with the decision to consult a physician. A previous study reported the same finding and also found that age was associated with the decision to seek a physician for LUTS [10]. Furthermore, we found that the severity of LUTS was associated with several other factors, including age, education level, income level, living environment, and most importantly marital status and family structure. Marital status and family structure had an impact on access to care for LUTS and were correlated with a greater likelihood of patients neglecting their symptoms. In particular, some patients who had low income levels, were separated or divorced, or who resided within a nonmultigenerational family structure did not necessarily seek medical care, even with severe LUTS, perhaps due to the relative weakness of such family structures. This may be exacerbated by the possibility that such a family structure may be accompanied by having a lower income or being separated or divorced. On the contrary, certain urinary symptoms, such as nocturia, might lead men with LUTS to actively seek treatment. Nocturia can lead to daytime drowsiness and can impact concentration and decrease motivation, which may negatively affect the ability to perform activities [29] and lead men to seek care. However, in general, many patients ignore LUTS until it becomes so severe that they cannot continue without medical care.

There are some substantial differences in the diagnosis and treatment of LUTS among different countries. In the UK, men with LUTS were less likely to be diagnosed than those in other European countries. In Italy, men with LUTS were more likely to be diagnosed, followed by Germany, France, and Spain. Different healthcare systems may affect access to care, and cultural differences also influence the rate of access [28].

This observational study evaluated the prevalence of LUTS/BPH and the pattern of treatment via a nationwide survey. However, our results should be interpreted within the context of our study's limitations. First, this study was an observational study, and we did not interfere with the treatment patterns. Second, our data did not include clinical laboratory data. Therefore, we were unable to assess objective data such as maximal flow rate and postvoid residual urine volume on uroflowmetry. Despite these limitations, this study cohort was representative of national data and we were able to evaluate the prevalence of LUTS/BPH and to assess current treatment patterns.

In conclusion, the severity of LUTS was found to increase according to age and the IPSS-QoL score among participants in our study. Furthermore, many participants with moderate to severe LUTS had not been diagnosed with or treated for LUTS/BPH. This lack of treatment was associated with several factors, including socioeconomic and individual health conditions.

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