Submitted: 05 December, 2023 Accepted: 04 January, 2024 Published: 30 June, 2024 DOI:10.22514/jomh.2024.094

ORIGINAL RESEARCH

JOMH Journal of Men's Health

The association between lower urinary tract symptoms and depressive symptoms in older Korean adults: a cross-sectional study

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Abstract

This study aimed to investigate the relationship between lower urinary tract symptoms (LUTS) and depressive symptoms in Korean adults aged 60 and above. We prospectively collected data from 524 older adults (68.7% male, 31.3% female) who visited a community center called Bitgoeul Senior Health Town, Gwangju, Korea, between 2021 and 2022. The mean age of the participants was 77.78 $\pm$ 5.44 years. All participants completed a set of questionnaires, including the International Prostate Symptom Score (IPSS), Subjective Memory Complaints Questionnaire (SMCQ), and Geriatric Depression Scale Short Form (GDS-SF). The mean total IPSS score was 8.76 $\pm$ 6.10, the mean SMCQ 3.68 $\pm$ 2.66, and the mean GDS-SF score 2.75 $\pm$ 3.15, respectively. Severe voiding symptoms were more prevalent in older adults with advanced age, insomnia and high SMCQ and GDS-SF scores. Multivariable analyses revealed that IPSS was significantly associated with depressive symptoms ($\beta = 3.233$, $p < 0.001$). Furthermore, female gender (95% confidence interval (CI): 1.11–4.07, odds ratio (OR) = 2.12, $p = 0.023$). Moderate or severe IPSS scores (95% CI: 1.03–2.98, OR = 1.75, $p = 0.040$) and high SMCQ scores (95% CI: 2.14–6.15, OR = 3.62, $p < 0.001$) were identified as independent risk factors for depression in older adults. Our findings indicate a significant association between the severity of subjective voiding symptoms and depressive symptoms in older Korean adults. These results underscore the necessity of assessing and managing LUTS in this demographic, considering patients' mental health and overall well-being.

Keywords

Aged; Health care surveys; Lower urinary tract symptoms; Depression

1. Introduction

Lower Urinary Tract Symptoms (LUTS) are a prevalent medical condition among older adults, contributing to considerable morbidity and reduced quality of life [1, 2]. This condition includes a wide range of urinary symptoms, notably those related to voiding and storage, which are increasingly prevalent in older adults [1]. Similar to global trends, the incidence of LUTS in Korea is expected to rise with the aging population.

Increasing evidence indicates that the impacts of LUTS extend beyond physical discomfort, exhibiting a strong link to mental health issues, particularly depression [3]. Depression is a prevalent mental health disorder among older adults, with a complex etiology that includes both biological and environmental factors [4]. The interplay between physical health and mental health is of growing interest, and an increasing number of studies have suggested that chronic physical health conditions, such as LUTS, may exacerbate or even trigger depressive symptoms [5, 6].

For decades, many studies have been conducted to investigate the association between LUTS and mental health issues. Initially, physicians found a link between LUTS and psychiatric problems such as depression and anxiety in anecdotal events. The cross-sectional study called "Epidemiology of LUTS (EpiLUTS)" revealed that patients with LUTS had higher anxiety and depression scores than those without LUTS [7]. In a longitudinal study, patients with overactive bladder (OAB) symptoms showed a higher incidence of psychiatric problems, including depression, anxiety and sleep disorders, than those in the control group [8]. Recently, a systemic review demonstrated a correlation between OAB and psychiatric symptoms with evidence of moderate certainty (Grading of Recommendations, Assessment, Development and Evaluations level 2) [9].

Nevertheless, the precise correlation between LUTS and depression among older Korean adults remains inadequately explored. Additionally, older adults are often underrepresented in clinical research, underscoring the importance of studies

focused on this age group to improve healthcare outcomes. The present study aimed to investigate the association between LUTS and mental health, particularly focusing on depressive symptoms, in Korean adults aged 60 and above.

2. Material and methods

2.1 Data collection

In this cross-sectional observational study, we prospectively collected data from 524 older patients who visited a community center called the Bitgoeul Senior Health Town, Gwangju, Republic of Korea, between 2021 and 2022. All participants completed a collection of questionnaires, including the International Prostate Symptom Score (IPSS), Subjective Memory Complaints Questionnaire (SMCQ), and Geriatric Depression Scale Short Form (GDS-SF).

We evaluated respondents' demographic characteristics, including age, body mass index (BMI), sex (male or female), smoking status, education level (less than or equal to 12 years), self-rated health, the presence of a housemate, skeletal muscle mass, sleep duration (hours), and insomnia. Furthermore, a set of questionnaires (IPSS, SMCQ and GDS-SF) was used to assess the severity of lower urinary tract symptoms (LUTS), subjective cognitive decline, and depression in older adults, respectively.

2.2 Validated questionnaires

IPSS is a scoring system used to evaluate the severity of lower urinary tract symptoms (LUTS) [10–12], which consists of seven questions that assess voiding and storage symptoms. The total score from the seven questions ranges from 0 to 35. In general, the score 0–7, 8–19 and 20–35 is regarded as mild, moderate and severe, respectively. In addition to the seven LUTS questions, quality of life is calculated on a 0–6 scale.

SMCQ is a brief, reliable and valid questionnaire to evaluate older patients' cognition. It is a self-reported screening test for subjective cognitive decline with a sensitivity of 0.75 and a specificity of 0.69 [13]. The questionnaire is made up of 14 questions for general and everyday memory, which are answered "yes" or "no" with a score of "1" or "0", and the cut-off value is a score of 6, which is a recognized threshold for identifying dementia [13].

GDS-SF is a screening tool for identifying depression in older adults [14]. The questionnaire, derived from the original GDS-LF, consists of a subset of 15 questions that exhibit the highest correlation with depressive symptoms [14]. Each question is answered as "yes" or "no" with a scale of "1" or "0" points [14]. A score of 0 to 5 is normal, a score over 5 suggests depression, and a score of 10 or more nearly always indicates depression.

2.3 Statistical methods

Statistical analyses were performed using STATA software, version 16.1 (StataCorp, College Station, TX, USA). Mean values and standard deviations are reported for continuous variables, and categorical variables are reported as frequencies (%). Fisher's exact tests, Pearson chi-square tests, and one-way analyses of variance are used to compare variances across the different IPSS severity groups. Multivariable linear regression was performed to determine factors influencing IPSS. Multivariable logistic regression was performed to analyze the effect of factors on geriatric depression. Statistical significance was set at $p < 0.05$ for all analyses.

3. Results

Table 1 presents data from the 524 older adult participants, of whom 360 (68.7%) were men, and 164 were women. The average age was 77.78 $\pm$ 5.44 years. 242 (46.2%) patients experienced insomnia. The average total IPSS score was 8.76 $\pm$ 6.10, the mean SMCQ score was 3.68 $\pm$ 2.66, and the mean GDS-SF score was 2.75 $\pm$ 3.15. IPSS severity was reported for all participants (n = 524), with 249 (47.5%) responding as mild, 240 (45.8%) as moderate, and 35 (6.7%) as severe.

In Table 2, demographic data was described according to the IPSS severity. There was a significant increase in IPSS severity with age ($p < 0.001$). Severe LUTS were more prevalent among older patients with insomnia ($p < 0.001$), high SMCQ scores ($\geq$6; $p < 0.001$), and high GDS-SF scores ($\geq$10; $p < 0.001$). Smoking was also associated with IPSS severity, with ex- or current smokers more prevalent among severe IPSS respondents than mild or moderate IPSS. This trend was the opposite in non-smokers.

According to multivariable analyses, severe LUTS were significantly associated with depression among older adults. In a multivariable linear regression analysis for IPSS (Table 3), current smoking, high SMCQ score, and high GDS-SF score were positively correlated with total IPSS scores ($\beta = 2.13$, $p = 0.049$; $\beta = 1.100$, $p = 0.025$; $\beta = 3.23$, $p < 0.001$). Conversely, sleep duration was negatively correlated with the total IPSS score ($\beta = -0.322$, $p = 0.027$).

In multivariable logistic regression for associated factors with geriatric depression (Table 4), female gender (95% confidence interval (CI): 1.11–4.07, odds ratio (OR) = 2.12, $p = 0.023$), moderate or severe IPSS score (95% CI: 1.03–2.98, OR = 1.75, $p = 0.040$), and high SMCQ score (95% CI: 2.14–6.15, OR = 3.62, $p < 0.001$) were identified as independent risk factors for depression in older adults.

4. Discussion

Our cross-sectional observational study revealed a significant association between the severity of subjective lower urinary tract symptoms and depression among older Korean adults. Significantly, severe LUTS were related to insomnia, high SMCQ scores, and high GDS-SF scores. While current smoking and high scores on both SMCQ and GDS-SF were positively correlated with IPSS, sleep duration exhibited a negative correlation with the total IPSS. Regarding independent risk factors for depression in this demographic, female gender and moderate or severe IPSS scores were identified in multivariable analysis.

LUTS are prevalent urological issues among older adults, affecting both men and women [1]. However, the majority of studies exploring the LUTS-depression nexus have typically focused on either gender but not both. Ninomiya *et*

TABLE 1. Demographic characteristics of the older adults.

Variables	N = 524
Age (yr)	77.78 ± 5.44
BMI (kg/m^2)	24.76 ± 4.77
Sex	
Male	360 (68.7%)
Female	164 (31.3%)
Smoking	
None	254 (48.5%)
Current	17 (3.2%)
Ex	253 (48.3%)
Education state (duration, yr)	12.91 ± 3.79
<12	123 (23.5%)
≥12	401 (76.5%)
Self-rated health	
Excellent	31 (5.9%)
Good	227 (43.3%)
Not bad	207 (39.5%)
Bad	50 (9.5%)
Very bad	9 (1.7%)
Presence of housemate	432 (82.4%)
Skeletal muscle mass (kg)	25.35 ± 4.77
Sleep time (h)	6.36 ± 1.34
Insomnia	242 (46.2%)
SMCQ score	3.68 ± 2.66
<6	419 (80.0%)
≥6	105 (20.0%)
GDS-SF score	2.75 ± 3.15
0–5	430 (82.1%)
6–9	68 (13.0%)
≥10	26 (4.9%)
IPSS score	
Total	8.76 ± 6.10
Voiding symptoms	4.48 ± 4.26
Storage symptoms	4.28 ± 2.77
Quality of life score	1.98 ± 1.39
IPSS severity	
Mild (0–7)	249 (47.5%)
Moderate (8–19)	240 (45.8%)
Severe (20–35)	35 (6.7%)

BMI: body mass index; IPSS: International Prostatic Symptom Score; GDS-SF: Geriatric depression scale short form; SMCQ: Subjective memory complaints questionnaire. Data were represented as mean ± standard deviation.

al. [15] conducted a comprehensive study on 4151 middle-aged women with LUTS and deduced that LUTS severity was aligned with depression. Chow *et al.* [16] discerned that stress urinary incontinence adversely affected both physical and mental health and quality of life.

Furthermore, stress urinary incontinence emerged as an independent risk factor for anxiety and depression, leading to significant disruptions at work. Concerning male patients, Glaser *et al.* [17] observed that although modifiable clinical factors such as sleep disturbances and depression were associated with LUTS, they did not consistently predict the LUTS prognosis following urological evaluation and ongoing monitoring. This finding resonates with our research conclusions, underscoring the need for a randomized study with a bidirectional assessment approach.

Compared to previous studies, our study targeted both women and men over 60 years. Our study revealed that LUTS were more prevalent with aging. While voiding symptoms were more prevalent in men than women (5.05 ± 4.34 *vs.* 3.23 ± 3.81; $p < 0.001$), storage symptoms were not significantly different between men and women. However, the mean storage score (3.97 ± 2.87) was numerically higher than the mean voiding score (3.23 ± 3.81) in women (**Supplementary Table 1**). Liu *et al.* [18] reported similar results of LUTS prevalence increasing with age. The most common types of LUTS differed between men and women, with storage symptoms being the most common.

Analyzing the voiding and storage subscores of the International Prostate Symptom Score (IPSS) revealed a significant association with depressive symptoms. Participants with a GDS score of 6 or higher exhibited a higher voiding score than those with a GDS score below 6 (6.18 ± 4.88 *vs.* 4.10 ± 4.03, $p < 0.001$). Similarly, individuals with a GDS score of 6 or higher demonstrated an increased storage score in contrast to those with a GDS score below 6 (5.32 ± 3.15 *vs.* 4.05 ± 2.63, $p < 0.001$) (see **Supplementary Table 2**).

In line with the findings of Mohamad Anuar MF, *et al.* [2], our research also noted that as self-rated health conditions worsened (rated as bad or very bad), there was an observed increase in LUTS severity. Consequently, a poor health condition may be associated with LUTS severity.

Moreover, our study indicated a positive correlation between IPSS and both cognitive decline (as indicated by a high SMCQ score ≥6) and depression (as indicated by a high GDS-SF score ≥10). Concerning depression, multivariable logistic regression suggests that this correlation is associated with a high SMCQ, high IPSS and female gender. While these findings highlight a statistical relationship, it is important to note that establishing a causal link would require further experimental research or in-depth analysis.

A significant association between LUTS and mental health has been of increasing interest [5, 15–17, 19–21]. LUTS were correlated with depression, anxiety, and stress symptoms in previous studies [21, 22]. In our study, cognitive decline and depression were significantly related to LUTS. Variations in the mental health variables might be attributed to the use of different questionnaires. Regarding insomnia or sleep disorders, our study aligns with the findings of Yoo *et al.* [23], suggesting a mutual influence between LUTS and sleep disorders, such as

TABLE 2. Comparisons of demographic data according to IPSS severity.

Variable	Mild (n = 249)	Moderate (n = 240)	Severe (n = 35)	*p*-value
Age (yr)	76.71 ± 5.30	78.68 ± 5.31	79.17 ± 63.00	<0.001
BMI (kg/m^2)	24.83 ± 2.72	24.75 ± 2.86	24.39 ± 2.36	0.675
Smoking				
None	137 (55.0%)	110 (45.8%)	7 (20.0%)	<0.001
Current	4 (1.6%)	11 (4.6%)	2 (5.7%)	
Ex	108 (43.4%)	119 (49.6%)	26 (74.3%)	
Education state (duration, yr)				
<12	57 (22.9%)	58 (24.2%)	8 (22.9%)	0.942
≥12	192 (77.1%)	182 (75.8%)	27 (77.1%)	
Self-rated health				
Excellent	23 (9.2%)	8 (3.3%)	0 (0.0%)	<0.001
Good	122 (49.0%)	97 (40.4%)	8 (22.9%)	
Not bad	90 (36.1%)	105 (43.8%)	12 (34.3%)	
Bad	13 (5.2%)	26 (10.8%)	11 (31.4%)	
Very bad	1 (0.4%)	4 (1.7%)	4 (11.4%)	
Presence of housemate	212 (85.1%)	190 (79.2%)	30 (85.7%)	0.193
Skeletal muscle mass (kg)	25.15 ± 5.30	25.45 ± 4.35	25.99 ± 3.47	0.553
Sleep time (h)	6.51 ± 1.27	6.30 ± 1.32	5.71 ± 1.66	0.003
Insomnia	83 (33.3%)	132 (55.0%)	27 (77.1%)	<0.001
SMCQ score				
<6	217 (87.2%)	182 (75.8%)	20 (57.1%)	<0.001
≥6	32 (12.8%)	58 (24.2%)	15 (42.9%)	
GDS-SF score				
0–5	219 (88.0%)	189 (78.8%)	22 (62.9%)	<0.001
6–9	22 (8.8%)	42 (17.5%)	4 (11.4%)	
≥10	8 (3.2%)	9 (3.7%)	9 (25.7%)	

BMI: body mass index; IPSS: International Prostatic Symptom Score; GDS-SF: Geriatric depression scale short form; SMCQ: Subjective memory complaints questionnaire.

TABLE 3. Multivariable linear regression analysis for IPSS.

Variables	IPSS (total)	
	Standardized coefficient β	*p*-value
Age	0.071	0.059
BMI	−0.052	0.584
Current smoking	2.113	0.049
Sleep time	−0.322	0.027
Insomnia	0.724	0.068
SMCQ score (≥6)	1.100	0.025
GDS-SF score (≥10)	3.233	<0.001

IPSS: International Prostatic Symptom Score; BMI: body mass index; GDS-SF: Geriatric depression scale short form; SMCQ: Subjective memory complaints questionnaire.

TABLE 4. Multivariable logistic regression for associated factors with geriatric depression.

Variables	Univariate analysis		Multivariate analysis	
	Odds ratio (95% CI)	*p*-value	Odds ratio (95% CI)	*p*-value
Age (yr)	1.01 (0.97–1.05)	0.648		
Sex				
Male	Reference			
Female	1.93 (1.22–3.05)	0.005	2.12 (1.11–4.07)	0.023
BMI (kg/m^2)	1.03 (0.81–2.67)	0.501		
Education state (duration, yr)				
<12	Reference			
≥12	0.46 (0.28–0.75)	0.002	0.74 (0.42–1.30)	0.296
Smoking				
None	Reference			
Current	0.51 (0.11–2.28)	0.375		
Ex	0.69 (0.44–1.09)	0.112		
Sleep time (h)	0.81 (0.68–0.96)	0.013	0.93 (0.77–1.12)	0.443
State of feeling good sleep	0.51 (0.32–0.80)	0.003		
Insomnia	1.65 (1.05–2.58)	0.029	1.21 (0.72–2.02)	0.472
Skeletal muscle mass (kg)	0.95 (0.90–1.00)	0.036	1.02 (0.96–1.08)	
SMCQ score				
<6	Reference			
≥6	5.00 (3.08–8.14)	<0.001	3.62 (2.14–6.15)	<0.001
IPSS				
0–7	Reference			
≥8	2.21 (1.38–3.55)	0.001	1.75 (1.03–2.98)	0.040

BMI: body mass index; IPSS: International Prostatic Symptom Score; SMCQ: Subjective memory complaints questionnaire.

insomnia or sleep duration. Contrary to this opinion, Park *et al.* [20] argued that sleep disorder was not associated with LUTS but rather a consequence of LUTS.

It is still unknown exactly what mechanism links concomitant depression and LUTS. Recently, inflammation was suggested as pivotal in the pathway wherein stressors in the lower urinary tract culminate in psychiatric outcomes. Hughes *et al.* [24] posited that many conditions leading to LUTS exhibited an inflammatory component, predominantly rooted in neuroinflammation within the central nervous system. This offers a mechanistic insight into the connection between LUTS and mood disorders. There is also the potential for reverse causation: psychological factors, including those associated with obsessive-compulsive and other psychiatric disorders, have been linked to an increased prevalence of functional urinary symptoms. These symptoms encompass conditions such as overactive bladder, heightened urgency and frequency, incontinence and enuresis [25, 26].

While the pathophysiology linking LUTS to mental health disorders, including sleep disturbances, remains undefined, older adults with mental health disorders are advised to undergo screening for LUTS. Given the COVID-19 pandemic's constraints, such as social distancing to prevent viral spread, a multidisciplinary approach to treatment is essential. This approach will aid patients' individualized management, especially considering the increased anxiety and stress associated with LUTS in men during times of social disruption [27].

Our study had several limitations. First, our study population was comprised of visitors to a single senior community center in the Republic of Korea, which may introduce selection bias and limit the generalizability of the findings to the broader older Korean adult population. Second, the gender imbalance in the study population (68.7% male *vs.* 31.3% female) limits the generalizability of findings, especially considering potential gender-based differences in LUTS and mental health. Third, relying on self-reported questionnaires does not exclude the possibility of chronic disease(s) that could explain LUTS. Finally, the absence of follow-up data also restricts understanding of the long-term relationship between LUTS and depression, as well as the directionality of this relationship. For future studies, a more in-depth analysis, including the examination of IPSS and the Overactive Bladder Symptom Score (OABSS) and the evaluation of specific LUTS subdomains, could contribute to the development of more individualized treatments for older patients.

5. Conclusions

This study elucidated a significant correlation between severe LUTS and depression in older Korean adults. The data demonstrated that increased LUTS severity was significantly linked to higher depressive symptoms, particularly among women, smokers, and those with insomnia. Factors such as higher SMCQ scores and smoking status were positively correlated with LUTS severity, while adequate sleep appeared to mitigate this risk. These findings underscored the importance of comprehensive healthcare approaches for older adults that address both urological conditions and mental health, highlighting the need for targeted interventions to improve this population's overall well-being.

AVAILABILITY OF DATA AND MATERIALS

The data are contained within this article and supplementary material.

AUTHOR CONTRIBUTIONS

DGL, SHY, JWK, JYH, MHS and KP—designed the research study. DGL, SHY and KP—performed the research; wrote the manuscript. DGL and SHY—analyzed the data. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was conducted following the Declaration of Helsinki and was approved by the Ethics Committee of Chonnam National University Hospital Institutional Review Board (IRB No. CNUH-2020-137, 21 May 2020). All patients provided written informed consent prior to enrollment.

ACKNOWLEDGMENT

We thank the Bitgoeul Senior Health Town, Gwangju, Republic of Korea for clinical data collection.

FUNDING

This research was funded by Chonnam National University (Grant number: 2020-3943) and partly supported by the Advanced Institute of Aging Science, Chonnam National University (2023-0381-01).

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at https://oss.jomh.org/files/article/1806563992381865984/attachment/Supplementary%20material.docx.

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How to cite this article: Do Gyeong Lim, Seong Hyeon Yu, Ju-Wan Kim, Jae-Young Han, Min-Ho Shin, Kwangsung Park. The association between lower urinary tract symptoms and depressive symptoms in older Korean adults: a cross-sectional study. Journal of Men's Health. 2024; 20(6): 78-84. doi: 10.22514/jomh.2024.094.