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Research Article

The relationship between depression, anxiety and lower urinary tract symptoms in men

Yu Seob Shin ^a, Kiran Kumar Soni ^b, Dong Yun Lee ^c, Sung Chul Kam ^{d,*}^a Department of Urology, Jeonbuk National University Medical School, Research Institute of Clinical Medicine of Jeonbuk National University, Biomedical Research Institute of Jeonbuk National University Hospital, Jeonju, Korea^b Department of Physiology, Lord Buddha Koshi Medical College and Hospital, Saharsa, Bihar, India^c Department of Psychiatry, Gyeongsang National University Changwon Hospital, Gyeongsang National University School of Medicine, Jinju, Korea^d Department of Urology, Gyeongsang National University Changwon Hospital, Institute of Health Sciences of Gyeongsang National University, Gyeongsang National University School of Medicine, Jinju, Korea

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ABSTRACT

Purpose: Patients with lower urinary tract symptoms (LUTS) often experience comorbid depression and anxiety, yet the mechanisms underlying this association remain incompletely understood. This prospective study aimed to investigate the relationship between depression, anxiety, and LUTS in men.**Materials and methods:** A prospective study was conducted with 350 male patients who underwent urologic examinations at our institution from January 2021 to December 2021. Of these, 131 patients meeting the inclusion criteria were included. Various questionnaires, including the International Prostate Symptom Score (IPSS) and the Hospital Anxiety and Depression Scale (HADS), as well as LUTS examinations (prostate-specific antigen test, transrectal ultrasonography, and urine flowmetry), were administered.**Results:** Among the 350 patients, 131 were included in the analysis, with an average age of 58.0 ± 13.69 years. The total IPSS was 18.0 ± 8.69, with the average voiding symptom score at 8.7 ± 5.19 and the average storage symptom score at 6.0 ± 3.27. Both anxiety and depression were found to be correlated with LUTS ($P < 0.05$). After adjusting for age, hypertension, and diabetes, anxiety (but not depression) was significantly associated with LUTS based on regression analysis.**Conclusion:** Men with LUTS are more likely to experience anxiety. Therefore, it is essential to assess and address anxiety when managing men with LUTS.© 2024 The Asian Pacific Prostate Society. Published 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

Anxiety, characterized by a state of unpleasant apprehension about anticipated events [1], affects approximately 20% of the general population [2]. Conversely, depression, a condition marked by a low mood impacting thoughts, behavior, motivation, feelings, and overall well-being [3], is prevalent in around 6% of the population [2]. Lower urinary tract symptoms (LUTS) encompass a spectrum of issues, including obstruction, hesitancy, prolonged micturition, and a sense of incomplete bladder emptying [4]. Anxiety and depression not only bring about mental but also physical changes in men. Somatic symptom disorder (SSD)

describes the physical manifestations of anxiety and depression [5]. These somatic symptoms, which often result from unconscious psychological stress, may include voiding and storage bladder symptoms, hence referred to as “bladder SSD,” potentially involving brain mechanisms [2]. An overactive bladder, characterized by urinary urgency and frequency and, in some cases, voiding difficulty [6–9], is one facet of bladder SSD.

Interestingly, LUTS tends to be prevalent in individuals experiencing depression, with a prevalence of 25.9% [8, 9]. While voiding and storage bladder symptoms are noted in cases of major depression, assessing the degree of depression based on contributing factors remains a challenge [8–10].

In recent years, public awareness of mental health issues has grown substantially. Depression and anxiety, being common psychological discomforts, are experienced by a significant portion of the population. Paradoxically, despite the prevalence of these

* Corresponding author. Department of Urology, Gyeongsang National University Changwon Hospital, Gyeongsang National University School of Medicine, 15 Jinju-daero 816beon-gil, Jinju, 52727, Korea.

E-mail address: kamsungchul@hanmail.net (S.C. Kam).

psychological discomforts, societal biases often discourage individuals from seeking appropriate medical treatment. Conversely, addressing physical symptoms that accompany psychological discomfort is generally more socially acceptable. Urinary symptoms such as increased frequency, nocturia, and residual urine sensation are common companions of depression and anxiety. LUTS can manifest in early childhood and become more prevalent as individuals age, with a secondary increase in incidence related to aging [11]. Bi-directional studies suggest that anxiety disorders are prone to causing LUTS, with a frequency almost double that of normal cases [12]. The interplay between psychological discomforts and LUTS can profoundly impact the quality of life. Consequently, these factors must be concurrently considered. Nonetheless, prospective studies are essential to validate the causality and association between anxiety, depression, and LUTS. This prospective study aims to elucidate the connection between depression, anxiety, and LUTS.

2. Materials and methods

2.1. Patients

This study encompassed 350 men who underwent comprehensive urological examinations at our institution between January 2021 and December 2021. Among them, only 131 individuals met the stringent inclusion criteria and consented to participate. Each participant provided written informed consent, and the study protocol received ethical committee approval (no. 2020-04-009-003). The inclusion criteria comprised men aged over 20 years with a primary complaint of LUTS. Exclusion criteria encompassed men with primary symptoms such as hematuria and pain that did not primarily indicate LUTS, as well as those who did not fully complete the required questionnaires and urinary assessments. All participants diligently completed a battery of self-reported and validated questionnaires, including the International Prostate Symptom Score (IPSS) and the Hospital Anxiety and Depression Scale (HADS). To assess LUTS severity, IPSS scores were categorized as follows: 0–7 (mildly symptomatic), 8–19 (moderately symptomatic), and 20–35 (severely symptomatic) [13]. HADS, developed by Zigmond and Snaith [14], serves as an acceptable, reliable, valid, practical, and user-friendly tool employed by clinicians to quantify and identify anxiety and depression [15]. Additionally, participants underwent a prostate-specific antigen (PSA) test, transrectal ultrasonography (TRUS), and urine flowmetry (UFM).

2.2. Statistical analysis

Descriptive statistics, including means and standard deviations, were computed for each variable. The correlation between LUTS and various variables was assessed through Pearson's correlation analysis, where appropriate. A significance threshold of $P < 0.05$ was employed for statistical significance. Statistical analysis was conducted using SAS (version 9.4, SAS Institute, Cary, NC, USA), with all tests being two-sided.

3. Results

The participants had a mean age of 58 ± 13 years. The total IPSS was 18.0 ± 8.69 , with an average voiding symptom score (including IPSS items 1, 3, 5, and 6) at 8.7 ± 5.19 and an average storage symptom score (including IPSS items 2, 4, and 7) at 6.0 ± 3.27 . Furthermore, the mean total HADS score, PSA level, TRUS findings, and UFM Qmax were 11 ± 7.3 , 2.0 ± 4.8 ng/mL, 31 ± 11 g, and 13 ± 9.5 mL/s, respectively (Table 1).

Table 1
Baseline characteristics of all participants

Variables (SD)	Total (N = 131)
Age, years	58.09 (± 13.69)
DM	15 (11.5%)
HTN	58 (44.3%)
PSA, ng/mL	2.06 (± 4.89)
Total IPSS	18.04 (± 8.69)
voiding subscore	8.74 (± 5.19)
Storage subscore	6.08 (± 3.27)
HADS	
Anxiety	5.11 (± 3.78)
Depression	6.39 (± 4.17)
Total	11.35 (± 7.30)
Uroflowmetry	
Qmax, mL/s	13.96 (± 9.54)
Prostate volume, cc	31.92 (± 11.57)

Abbreviations: SD: standard deviation, PSA: prostate specific antigen, IPSS: International Prostate Symptom Score, HADS: Hospital Anxiety and Depression Scale, Qmax: maximum flow rate, HTN: Hypertension, DM: Diabetes Mellitus.

3.1. Relationship between International Prostate Symptom Score and lower urinary tract symptoms

The Pearson correlation coefficient revealed significant associations between specific LUTS parameters and IPSS scores in patients with an IPSS ranging from 1 to 7. Specifically, IPSS scores of 1 to 6, though not 7, exhibited significant correlations with HADS anxiety, HADS depression, and total HADS scores. Conversely, PSA levels and TRUS findings did not display significant associations with any of the IPSS scores. However, UFM Qmax exhibited a significant correlation with IPSS scores ranging from 2 to 7, with no such correlation observed for an IPSS score of 1 (Table 2).

3.2. Correlation between voiding and storage symptoms of lower urinary tract symptoms

When the IPSS scores were segregated into voiding symptoms (IPSS items 1, 3, 5, and 6) and storage symptoms (IPSS items 2, 4, and 7), the Pearson correlation coefficient yielded similar patterns of association. Both voiding and storage symptom scores on the IPSS displayed significant correlations with HADS anxiety, HADS depression, total HADS scores, and UFM Qmax, albeit without significant associations with PSA levels and TRUS findings (Table 3).

3.3. Association between International Prostate Symptom Score and anxiety

Upon conducting regression analysis using voiding symptoms (IPSS items 1, 3, 5, and 6) and storage symptoms (IPSS items 2, 4, and 7), these scores demonstrated significant associations with the HADS anxiety score. Conversely, there was no such association with the HADS depression score. Moreover, voiding and storage symptom scores remained independent of age, hypertension, and diabetes. Similar findings were observed in the case of the IPSS total score (Table 4).

4. Discussion

Our results have unveiled a significant association between clinically significant LUTS and anxiety. Notably, LUTS exhibited a robust correlation with anxiety, while no such association was

Table 2
Correlation analysis between the HADS and LUTS parameters by IPSS among total 131 patients

	IPSS1	IPSS2	IPSS3	IPSS4	IPSS5	IPSS6	IPSS7
HADS							
Anxiety	0.291**	0.326**	0.388**	0.305**	0.300**	0.386**	0.005
Depression	0.242**	0.298**	0.335**	0.242**	0.326**	0.297**	0.026
Total	0.299**	0.361**	0.398**	0.299**	0.348**	0.364**	0.028
PSA	0.052	−0.044	0.035	0.021	0.117	−0.053	0.092
TRUS	0.053	−0.045	0.008	−0.103	−0.048	−0.049	−0.016
UFMmax	−0.139	−0.200*	−0.222*	−0.318**	−0.223*	−0.232**	−0.217*

Abbreviations: PSA: prostate specific antigen, IPSS: International Prostate Symptom Score, HADS: Hospital Anxiety and Depression Scale, Qmax: maximum flow rate, TRUS: Transrectal ultrasonography.

** $P < 0.01$, * $P < 0.05$.

Table 3
Correlation analysis between the HADS and LUTS parameters by the voiding and storage symptoms of LUTS among total 131 patients

	Voiding symptoms		Storage symptoms		Total score	
	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>	<i>r</i>	<i>P</i>
HADS						
Anxiety	0.428**	<0.001	0.298**	0.01	0.439**	<0.001
Depression	0.377**	<0.001	0.261**	0.03	0.390**	<0.001
Total	0.442**	<0.001	0.318**	0.00	0.459**	<0.001
PSA	0.047	0.589	0.023	0.798	0.029	0.745
TURS	−0.014	0.873	−0.072	0.414	−0.082	0.131
UFMQmax	−0.257**	<0.001	−0.322**	0.00	−0.272**	<0.001

Abbreviations: *r*: coefficient value, PSA: prostate specific antigen, IPSS: International Prostate Symptom Score, HADS: Hospital Anxiety and Depression Scale, Qmax: maximum flow rate, TRUS: Transrectal ultrasonography.

** $P < 0.01$, * $P < 0.05$.

observed with depression or basic parameters such as age, hypertension, and diabetes.

A study conducted in Taiwan also found a notably higher prevalence of anxiety and depression among patients with LUTS [16]. A study dating back to 1964 initially illuminated the association between anxiety, depression, and LUTS, and subsequent research has further substantiated this connection [17]. Moreover, LUTS has been shown to negatively impact individuals with heightened anxiety and depression levels, with 35.9% of men and 53.3% of women meeting the self-reported screening criteria for clinical anxiety (HADS score of ≥ 8) [18]. Mediation models have been employed to explore the intricate interplay between LUTS severity, mental health, and health-related quality of life (HRQOL). Interestingly, anxiety symptoms were found to entirely mediate the relationship between LUTS severity and HRQOL in men [19].

Table 4
Multivariate regression analysis between the HADS by the voiding and storage symptoms of LUTS among total 131 patients

	Voiding symptoms ($r^2 = 0.194$)			Storage symptoms ($r^2 = 0.110$)			Total score ($r^2 = 0.202$)		
	B	<i>t</i>	<i>P</i>	B	<i>t</i>	<i>P</i>	B	<i>t</i>	<i>P</i>
HADS									
Anxiety	0.462	2.884	0.005	0.215	2.027	0.045	0.775	2.903	0.004
Depression	0.163	1.131	0.260	0.070	0.736	0.463	0.296	1.230	0.221
Age	0.038	1.148	0.253	0.037	1.671	0.097	0.55	0.988	0.325
HTN	0.110	0.119	0.906	0.403	0.657	0.513	0.126	0.082	0.935
DM	2.102	1.549	0.124	0.919	1.025	0.307	3.620	1.603	0.111

Abbreviations: IPSS: International Prostate Symptom Score, HADS: Hospital Anxiety and Depression Scale, Qmax: maximum flow rate, HTN: Hypertension, DM: Diabetes Mellitus.

Our findings establish that LUTS (specifically, IPSS scores related to voiding and storage symptoms) are significantly associated with anxiety. This aligns with prior studies that have identified a higher prevalence of depression and anxiety among patients with LUTS compared to the general population. Moreover, the severity of LUTS has consistently been linked to the severity of depression and anxiety [20]. A meta-analysis further supports this connection, revealing a significant association between clinically significant anxiety and LUTS in both men and women [21]. Notably, anxiety has been implicated in the development and severity of LUTS, with studies demonstrating a significant association between anxiety and LUTS severity, particularly in women. Furthermore, anxiety has been found to be a better predictor of LUTS severity than depression [20, 21]. These collective findings underscore the intricate relationship between depression, anxiety, and LUTS. Individuals with LUTS are more prone to experiencing anxiety than depression, highlighting the need for healthcare providers to screen for both physical and mental health concerns in this population [12, 22].

The association between LUTS and anxiety or depression may be explained through various mechanisms. LUTS can significantly reduce HRQOL and lead to social anxiety [23]. Notably, some antidepressants used in clinical practice may pose a risk factor for LUTS [24]. Additionally, the cooccurrence of LUTS with anxiety and depression may be attributed to alterations in serotonin and norepinephrine concentrations within the central nervous system in individuals with LUTS [25–27].

However, it is crucial to acknowledge several limitations in our study. Data collection was restricted to hospital records within a one-year timeframe, and we were unable to assess the final mental state of the patients. Consequently, our results may be subject to some inaccuracy. Furthermore, we relied on self-reported measurements, and the absence of a definitive diagnostic tool may be considered a limitation. Additionally, our study did not exclude urinary cancer diseases such as prostate and bladder cancer, although individuals with hematuria were excluded from the study.

5. Conclusion

In conclusion, our findings establish a significant association between LUTS and anxiety but not with depression. The mode of symptom screening employed can aid in diagnosing and managing both urological and psychological symptoms.

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Ethics statement

The present study protocol was reviewed and approved by the institutional review board of Gyeongsang National University Changwon Hospital (Reg. No. 2019-06-007). Informed consent was submitted by all subjects when they were enrolled.

Author contributions

Conceptualization: Sung Chul Kam. Data curation: Sung Chul Kam. Formal analysis: Dong Yun Lee. Investigation: Sung Chul Kam, Yu Seob Shin. Methodology: Yu Seob Shin, Dong Yun Lee. Project administration: Dong Yun Lee, Yu Seob Shin. Resources: Kiran Kumar Soni. Supervision: Sung Chul Kam. Validation: Sung Chul Kam, Yu Seob Shin. Visualization: Kiran Kumar Soni, Yu Seob Shin. Writing—original draft: Kiran Kumar Soni, Yu Seob Shin. Writing—review & editing: Sung Chul Kam, Yu Seob Shin.

Conflicts of interest

All authors have no conflict of interest to declare.

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