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The relationship between anxiety and overactive bladder/urinary incontinence symptoms in the clinical population

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Abstract

Objective—To investigate the relationship between anxiety and overactive bladder/urinary incontinence symptoms among clinical population.

Methods—Patients who were diagnosed with overactive bladder (OAB) and age-matched control subjects without OAB were enrolled. Anxiety symptoms were assessed using the Hospital Anxiety and Depression Scale (HADS-A). OAB/incontinence symptoms were assessed using the ICIQ-UI, ICIQ-OAB, UDI-6, IIQ-7, and OAB-q. Other psychosocial factors were also assessed.

Results—About half of the OAB subjects (48%) had anxiety symptoms, and one quarter of OAB subjects (24%) had moderate to severe anxiety. OAB subjects reported significantly higher anxiety symptoms compared to age-matched controls (HADS-A: 7.5 ± 4.5 versus 3.3 ± 3.6, $p<0.001$). OAB subjects with anxiety reported more severe OAB/incontinence symptoms, greater bother and impact on quality of life compared to OAB subjects without anxiety (ICIQ-UI, ICIQ-OAB, UDI-6, IIQ-7, OAB-q, p-values all <0.05). OAB subjects with anxiety also have more psychosocial difficulties (e.g., more depression, higher stress levels). Among OAB subjects, there were positive correlations between the severity of anxiety symptoms and the severity of OAB/incontinence symptoms (Spearman's correlation coefficients 0.29 to 0.47, $p<0.05$). OAB subjects with both anxiety and depression reported higher ICIQ-UI and IIQ-7 scores than those who had anxiety but no depression ($p=0.014$, 0.025 respectively).

Conclusions—OAB patients reported higher anxiety symptoms compared to controls. OAB patients with anxiety reported more severe OAB/incontinence symptoms, worse quality of life, and more psychosocial difficulties compared to OAB patients without anxiety. There are positive correlations between the severity of anxiety symptoms and OAB/incontinence symptoms.

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Keywords

overactive bladder; urinary incontinence; urinary urgency; anxiety; psychosocial

Introduction

Overactive bladder (OAB) represents a syndrome characterized by a myriad of lower urinary tract symptoms (LUTS) including urinary urgency, with or without urgency incontinence, usually with frequency and nocturia, in the absence of infection or other identifiable causes.[1] The true nature of OAB remains elusive – myogenic changes, neurologic changes, urothelial changes and afferent sensitization have been hypothesized to contribute to the symptomatology of OAB.

Contemporary studies suggested that affective factors might also be associated with OAB (reviewed in [2]). Bradley et al (2014) surveyed female veterans who recently returned from deployment to Iraq or Afghanistan and separated from the military. The authors showed that female veterans with anxiety symptoms are more likely to have bothersome urgency incontinence and/or frequency symptoms (odds ratio 2.7).[3] It was unclear whether this relationship is generalizable to the clinical OAB population since the veteran cohort was young (mean age of 31), and there were high rates of other mental health issues (19% had post-traumatic stress disorder, 27% had prior sexual assault). In the EpiLUTS study, which was an internet-based cross-sectional population survey, men and women who reported bothersome urgency and/or urgency incontinence symptoms were more likely to have anxiety than those with minimal symptoms or bother.[4–7] The limitation of the published literature is that most were population-based symptom surveys. It is unclear if the results from population-based studies are generalizable to the clinical OAB population since a clinical evaluation was not performed, and the clinical diagnosis of OAB could not be ascertained based on self-reported symptoms on surveys (e.g., bladder infection and early interstitial cystitis might mimic OAB symptoms). One study did examine clinic patients and showed higher anxiety scores among “OAB dry” patients, but unfortunately none of the patients in that study had urgency incontinence (there were no “OAB wet” patients).[8] To our knowledge, no studies have compared OAB patients with versus without anxiety, or have correlated the severity of their anxiety and OAB/incontinence symptoms.

Here we address the gap in the literature by specifically investigating the relationship between anxiety and OAB in the clinical population. We studied OAB patients who presented with bothersome symptoms and sought treatments in clinic, and phenotyped their psychosocial presentation. We also specifically compared OAB patients with versus without anxiety, and studied the correlation between the severity of their anxiety and OAB/incontinence symptoms.

Materials and Methods

Subjects

Between October 2012 and July 2014, adult patients, aged 18 or above, diagnosed with OAB and age-matched controls without OAB were recruited into this study that inquired their anxiety and urinary symptoms. For OAB, patients must complain of urinary urgency, with or without urgency incontinence, usually with frequency and nocturia, in the absence of infection or other identifiable causes, in accordance with the 2002 ICS definition of OAB.[1] The clinical evaluation was performed by one clinician (HL) and followed the published AUA guidelines.[9] Subjects with a history of urinary incontinence surgery, prostate surgery, urethral stricture disease, neurogenic bladder, urinary retention, pelvic radiation, tuberculosis cystitis, cyclophosphamide cystitis, genitourinary cancer, urinary stones, a documented positive urine culture in the past 6 weeks, or a post-void residual volume ≥150 mL were not eligible. Controls were recruited by local advertisement and research database. Controls must have no prior diagnosis of OAB or interstitial cystitis/bladder pain syndrome, no significant lower urinary tract symptoms (AUA symptom index < 7), no bladder or pelvic pain, and no evidence of urinary infection. Controls were age-matched to the OAB cohort. Age matching was operationalized by recruiting similar percentages of patients and controls in the following age bins: <35, 35–49, and ≥50 years old. All subjects signed an informed consent. The Washington University School of Medicine Institutional Review Board approved this study.

Assessment

Anxiety symptoms were assessed using the Hospital Anxiety and Depression Scale (HADS).[10] The questionnaire contains 7 items to assess anxiety symptoms (HADS-A) and 7 items to assess depressive symptoms (HADS-D). A score of ≥8 on the HADS-A was used to operationalize the presence of anxiety.[11] We have also used a cut-offs of HADS-A 8–10 to indicate mild anxiety and ≥11 for moderate/severe anxiety. The developers of the HADS have recommended these cut-off points for mild (8–10), moderate (11–14), and severe (15–21) anxiety,[10,11] and recent studies have adopted these cut-offs.[12] To quantify the severity of anxiety symptoms, we have also analyzed the HADS-A data as a continuous variable (HADS-A range 0 to 21).

OAB/incontinence symptoms were assessed using the following validated questionnaires: 1) International Consultation on Incontinence–Urinary Incontinence Short Form (ICIQ-UI),[13] 2) International Consultation on Incontinence Overactive Bladder (ICIQ-OAB),[14] 3) OAB-q Short Form,[15] 4) Urogenital Distress Inventory Short Form (UDI-6)[16], and 5) Incontinence Impact Questionnaire Short Form (IIQ-7).[16] Briefly, ICIQ-UI is a 4-item questionnaire that assesses the frequency, amount and interference of urinary incontinence. ICIQ-OAB is a 4-item questionnaire that inquires about daytime frequency, nighttime frequency, urgency, and urgency incontinence. OAB-q contains two sub-scales that assess symptom bother and condition-specific quality of life. UDI-6 and IIQ-7 measure urinary distress and incontinence impact.

In addition, the following questionnaires were used to assess other psychosocial factors: 1) depressive symptoms (HADS-D);[10] 2) Perceived Stress Scale (PSS) to assess the degree to which situations in one's life are perceived as being stressful; 3) Childhood Traumatic Events Scale (CTES) and Recent Traumatic Events Scale (RTES) to inquire about exposure and impact of traumatic life events (e.g., childhood sexual abuse); 4) Poly-Symptomatic, Poly-Syndromic Questionnaire (PSPS-Q) to identify subjects with high somatic symptom burden; 5) PROMIS-Sleep-8B to assess sleep quality; and 6) PROMIS-Fatigue-7A to assess the impact of fatigue on daily life. Details of the questionnaires were described in our previous publication.[17]

Statistical Analysis

Linear regression models (continuous variables) were used for multivariate comparisons between OAB and controls, and between the OAB subgroups (with versus without anxiety, with versus without depression), adjusting for age (continuous variable) and sex. Other potential covariates were not included in the models due to the given sample size. Spearman's correlation was used for correlation analyses. $P<0.05$ was considered significant difference. All statistical analysis was completed using the open source statistical package R v3.2.0.

Results

Demographics

Fifty-one adult OAB patients and 30 age-matched controls participated in this study. Appendix 1 describes the study population (demographics, OAB/incontinence symptoms, quality of life measures, and medical comorbidities). The mean age (± SD) of the OAB and the control groups was 53.8 ± 11.9 and 54.2 ± 12.3, respectively. There was no significant age or sex difference between OAB subjects and controls (p=0.984 and 0.14). As expected, OAB subjects had worse urinary symptoms and quality of life compared to controls.

Comparison of anxiety symptoms between OAB and controls

Table 1 compares the anxiety and other psychosocial measures between OAB patients and controls. About half of the OAB subjects (48%) had anxiety symptoms, and one quarter of OAB subjects (24%) had moderate to severe anxiety. OAB subjects reported significantly higher anxiety symptoms compared to age-matched controls (HADS-A: 7.5 ± 4.5 versus 3.3 ± 3.6, $p<0.001$, mean ± SD, multivariate linear regression after adjusting for age and sex). A significantly higher percentage of OAB subjects had anxiety (HADS-A ≥8) compared to controls (48.0% versus 13.3%, odds ratio=6.0, p=0.003). A higher percentage OAB subjects also reported moderate to severe anxiety symptoms (HADS-A ≥11) compared to controls (24.0% versus 3.3%, odds ratio=9.2, p=0.025).

Comparison of OAB/incontinence symptoms, quality of life, and other psychosocial measures between OAB subjects with and without anxiety

OAB subjects with anxiety (HADS-A≥8) reported more severe OAB/incontinence symptoms, greater bother and impact on quality of life compared to OAB subjects without anxiety (HADS-A <8), see Table 2 (ICIQ-UI, ICIQ-OAB, UDI-6, IIQ-7, OAB-q, p-values

all <0.05, multivariate linear regression after adjusting for age and sex). OAB subjects with anxiety also have more psychosocial difficulties–they had more depressive symptoms (HADS-D), higher psychological stress levels (PSS), higher somatic symptom burden (PSPS-Q), and greater impact on sleep quality and fatigue (PROMIS-sleep, PROMIS-fatigue) compared to OAB subjects without anxiety (p-values all <0.05).

Since most of the validated urologic questionnaires assess multiple urinary symptoms and presented the results as composite scores, we performed an exploratory analysis to compare the difference in individual symptoms between OAB subjects with and without anxiety (see Table 3). The results suggested that that anxiety was correlated with urinary incontinence symptoms. Patients with anxiety also reported higher numeric rating of their urgency symptoms (p=0.049). There was a trend towards higher urinary frequency in patients with anxiety (p=0.061 for the ICIQ frequency question, p=0.084 for the numeric rating scale of frequency), even though they did not meet criteria for significance, possibly due to small sample size.

Correlation between the severity of anxiety symptoms and OAB/incontinence symptoms

To quantify the severity of anxiety symptoms, we have also analyzed the HADS-A data as a continuous variable (HADS-A range 0 to 21). We then performed Spearman's correlation analyses between HADS-A and the various urinary, quality of life, and psychosocial measures (see Table 4). Among OAB subjects, there were positive correlations between the severity of anxiety symptoms (HADS-A) and the severity of OAB/incontinence symptoms, greater bother and impact on quality of life (ICIQ-UI, ICIQ-OAB, UDI-6, IIQ-7, OAB-q, Spearman's correlation coefficients 0.29 to 0.47, p-values all <0.05). There were also positive correlations between the severity of anxiety and depressive symptoms, psychological stress levels, somatic symptom burden, sleep quality and fatigue (HADS-D, PSS, PSPS-Q, PROMIS, p all <0.05).

OAB/incontinence symptoms in OAB patients with both anxiety and depression

Since there was a strong correlation between anxiety and depressive symptoms (Spearman's correlation = 0.77, p<0.001, see Table 4), we studied the influence of depression on the results. We compared the OAB/incontinence symptoms and quality of life measures among OAB subjects who had both anxiety and depression (HADS-A ≥8 and HADS-D ≥8) versus those who had anxiety but no depression (HADS-A ≥8 and HADS-D <8). OAB subjects with both anxiety and depression reported higher ICIQ-UI and IIQ-7 scores than those who had anxiety but no depression (p=0.014, 0.025 respectively, see Appendix 2). However no difference was noted in ICIQ-OAB, UDI-6 or OAB-q.

Comment

The main findings of this study are: 1) anxiety is prevalent among the clinical population – half of the OAB subjects had anxiety symptoms, and one quarter of OAB subjects had moderate to severe anxiety symptoms; 2) OAB subjects reported higher anxiety symptoms compared to controls; 3) OAB patients with anxiety reported more severe OAB/incontinence symptoms, worse quality of life, and more psychosocial difficulties compared to OAB

patients without anxiety; and 4) there is a strong dose-response relationship between the severity of anxiety and OAB/incontinence symptoms.

Anxiety and OAB are both prevalent in the population. The prevalence of anxiety disorders in is estimated to be around 11–18%,[18] while OAB affects 12–16% of adults in the population. One important research question is whether anxiety is causally related to OAB, or whether it is mere association or co-incidence. It is also not clear if anxiety is a causal factor for OAB symptoms or results from having these bladder symptoms (e.g.. the fear about finding a bathroom in time may cause anxiety). We suspect the link between anxiety and OAB is complex and multifactorial. To try to understand this relationship, we have applied the criteria outlined by Hill (1965) to examine for evidence of causality.[19] Data from this and other studies suggest that anxiety and OAB/incontinence might be casually related. First, the *strength of association* is significant – the odds ratios of having anxiety and moderate/severe anxiety in OAB versus healthy controls were 6.0 and 9.2 respectively in our study. In the veteran study by Bradley et al, the odd ratios were 2.7–3.5.[3] Second, the association between anxiety and OAB has been *consistently demonstrated* in this and other studies, across different study population (clinical population in this study, female veterans in Bradley et al,[3] internet surveys in the EpiLUTS study[4–7]) and in different countries (US, UK, Sweden, and others[20,21]). Third, we have demonstrated a strong *dose-response or gradient relationship* between anxiety and OAB/incontinence symptoms. Fourth, *temporal relationships* have been demonstrated in two longitudinal studies. The presence of urgency incontinence at baseline increased the odds of developing anxiety at 10 years, and conversely the presence of anxiety at baseline increased the odds of developing urgency incontinence at 10 years in a Norwegian study.[12] Bidirectional temporal relationship was also observed in a one-year longitudinal study from the UK.[22] Fifth, successful *management* of OAB symptoms with medications reduced the anxiety symptoms.[23] Finally, the association between OAB and anxiety appears to be *biologically plausible* (see below).

There is evidence in the basic science literature that anxiety and OAB/incontinence might have shared biological pathways. The serotonergic pathway appears to play various roles in anxiety.[24] Reduction of serotonin levels in the central nervous system is associated with urinary frequency and bladder contractions, while activation of the central serotonergic system with a 5-HT uptake inhibitor depresses reflex bladder contractions and increases the micturition threshold volume in animal studies.[25] Anxiety may thus be linked to OAB/incontinence via the serotonergic pathway. In fact, the serotonin-noradrenaline reuptake inhibitor (SNRI) duloxetine has been shown to improve the “wet” and “dry” symptoms of OAB in patients.[26] Another potential shared mechanism might be dysregulation of the hypothalamic-pituitary-adrenal (HPA) axis, resulting in increased corticotropin-releasing factor (CRF) release. CRF may play a role in anxiety disorders.[27] Administration of CRF stimulates bladder function (lowers the micturition threshold, intercontraction interval and micturition volume) whereas treatment with a CRF antagonist reduces detrusor overactivity in rat models of detrusor overactivity and anxiety.[28]

Although the mechanisms are biologically plausible, the evidence is based primarily on animal studies, and the potential shared mechanisms need to be formally studied in the clinical population. Overall, the mechanistic link between anxiety and OAB remains

suboptimally explained. This gap of knowledge may pave way for an improved understanding of the mechanisms governing OAB, with a potential for more targeted pharmacotherapy.

In this study we have focused primarily on anxiety. However in previous studies we have also examined other psychosocial issues such as stress levels and exposure to childhood sexual trauma in the OAB population.[17,29] Collectively our studies demonstrated the significant psychosocial morbidities experienced by OAB patients. It is possible that psychosocial factors may cause, maintain, and modulate OAB/incontinence and other lower urinary tract symptoms (LUTS) through these shared biological pathways. And if that is true, this may have therapeutic implications since adjuvant psychological intervention may have the potential to improve clinical outcome in urologic conditions. There was evidence that psychological therapy (defined as anxiety reduction, counseling and support in the study) improved urinary urgency and incontinence but not urinary frequency (which responded better to bladder training alone).[30] In light of these data, it may be worthwhile to study adjuvant psychological interventional trials for selected OAB patients in the future. It may also be important to study how anxiety modulates the clinical response to traditional OAB treatments. We recommend that psychosocial factors such as anxiety be assessed in patients with OAB, in addition to the traditional urologic factors.

The current study has limitations: 1) It was a single-institution study with small sample size, thus it may not have sufficient power for more detailed analyses (for example, comparison of anxiety and psychosocial factors between OAB patients with versus without incontinence, or adjusting for additional potential covariates such as medical comorbidities in the multivariate analysis); 2) findings from patients seeking care at a tertiary center because of the severity of their symptoms may not be generalizable to the general OAB population; and 3) assessment of anxiety was based on self-reported symptoms. Although the HADS-A is commonly used to assess for anxiety in the outpatient setting, it is not a diagnostic tool for anxiety disorder, and cannot be ascertained without psychiatric evaluation which were not performed here. Despite these limitations, many of the comparisons clearly demonstrated differences. Large multi-institutional studies of the clinical OAB population are needed to further examine these relationships.

Conclusions

OAB patients reported higher anxiety symptoms compared to controls. OAB patients with anxiety reported more severe OAB/incontinence symptoms, worse quality of life, and more psychosocial difficulties compared to OAB patients without anxiety. There are positive correlations between the severity of anxiety symptoms and OAB/incontinence symptoms.

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Abbreviations

HADS-A	hospital anxiety and depression scale–anxiety subscale
ICIQ	international consultation on incontinence
IIQ-7	incontinence impact questionnaire short form
OAB	overactive bladder
UDI-6	urogenital distress inventory short form
UI	urinary incontinence

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Appendix 1

Description of the study population

	OAB	Controls	p-value (adjusted for age and sex)
Demographics:			
No. of subjects	51	30	
Age (mean ± SD)	53.8 ± 11.9	54.2 ± 12.3	0.98
Sex (% females)	73%	57%	0.14
Race (% white)	43.1%	63.3%	0.08
Age of diagnosis of OAB (mean ± SD)	47.5 ± 15.2	Not applicable	
% with OAB symptoms less than one year?	24%	Not applicable	
Urinary symptoms: (mean ± SD)			
No. of daytime void[a]	1.8 ± 1.3	0.2 ± 0.6	<0.001
No of nighttime void[b]	2.6 ± 1.1	0.9 ± 0.7	<0.001
How often rush to bathroom to void?[c]	2.7 ± 0.9	0.6 ± 0.7	<0.001
How often does urine leak before getting to the bathroom?[d]	2.2 ± 0.9	0.3 ± 0.5	<0.001
Urinary questionnaires: (mean ± SD)			
ICIQ-UI (urinary incontinence, 0–21)	12.0 ± 4.9	1.4 ± 2.0	<0.001
ICIQ-OAB (overactive bladder, 0–16)	9.3 ± 2.6	2.0 ± 1.5	<0.001
OAB-q symptom bother subscale (6–36)	19.1 ± 6.6	2.2 ± 2.8	<0.001
OAB-q quality of life subscale (13–78)	29.7 ± 16.9	2.0 ± 3.0	<0.001
UDI-6 (urogenital distress inventory, 0–24)	12.6 ± 5.6	0.9 ± 1.4	<0.001
IIQ-7 (incontinence impact questionnaire, 0–28)	8.8 ± 8.2	0.1 ± 0.4	<0.001
Medical comorbidities:			
Hypertension	37%	33%	0.72
Diabetes	8%	3%	0.31
Stroke, transient ischemic attack	8%	7%	0.15
MI, angina	0%	0%	1.00

Based on the categories of response on the ICIQ-OAB questionnaire:

[a] How many times do you urinate during the day? 0=1 to 6 times, 1=7 to 8 times 2=9 to 10 times, 3=11 to 12 times, 4=13 or more times.

[b] During the night, how many times do you have to get up to urinate, on average? 0=none, 1=one time, 2=two times, 3=three times, 4=four or more times

[c] Do you have to rush to the toilet to urinate? 0=never, 1=occasionally, 2=sometimes, 3=most of the time, 4=all of the time

[d] Does urine leak before you can get to the toilet? 0=never, 1=occasionally, 2=sometimes, 3=most of the time, 4=all of the time

Appendix 2

OAB with both anxiety and depression versus OAB with anxiety but no depression (adjusted for age and sex)

	OAB with both anxiety and depression (HADS-A ≥ 8 and HADS-D ≥ 8)	**OAB with anxiety but no depression (HADS-A ≥ 8 and HADS-D <8)**	**p-value (adjusted for age and sex)**
Demographics:			
No. of subjects	13	11	
Age (mean ± SD)	56.5 ± 10.3	52.2 ± 12.0	0.384
Sex (% females)	61.5%	81.8%	0.386
HADS-A scores	12.0 ± 2.7	10.5 ± 3	0.161
HADS-D scores	10.4± 2.5	5.2 ± 2	<0.001
Urinary questionnaires: (mean ± SD)			
ICIQ-UI (urinary incontinence, 0– 21)	16.2 ± 3.6	12 ± 4.7	0.014
ICIQ-OAB (overactive bladder, 0–16)	10.2 ± 3.2	10.3 ± 2.1	0.891
OAB-q symptom bother subscale (6–36)	20.8 ± 6.9	22.5 ± 5.2	0.611
OAB-q quality of life subscale (13–78)	38.8 ± 17.8	34.5 ± 18.1	0.607
UDI-6 (urogenital distress inventory, 0–24)	15.8 ± 6.3	14.6 ± 5.6	0.639
IIQ-7 (incontinence impact questionnaire, 0–28)	16.6 ± 8.5	8.0 ± 7.3	0.025

Table 1

Comparison of anxiety and other psychosocial measures between OAB and controls (adjusted for age and sex)

	OAB (n=50)*	**Controls (n=30)**	**p-value (adjusted for age and sex)**
Anxiety measures:			
HADS-A (mean ± SD)	7.5 ± 4.5	3.3 ± 3.6	<0.001
% with HADS-A≥8 (presence of **anxiety**)	48.0%	13.3%	0.003
Odds ratio of having anxiety (HADS-A≥8) in OAB compared to controls (95% CI)	OR=6.0 (CI: 1.8 to 19.7)		
% with HADS-A ≥11 (**moderate to severe anxiety**)	24.0%	3.3%	0.025
Odds ratio of having moderate/severe anxiety (HADS-A ≥11) in OAB compared to controls (95% CI)	OR=9.2 (CI: 1.1 to 74.6)		
Other psychosocial measures: (mean ± SD)			
Depression (**HADS- D**)	5.3 ± 3.9	2.8 ± 3.9	0.004
Psychological stress level (**PSS**)	17.3 ± 8.1	10.7 ± 8.5	0.001
Somatic symptom burden (**PSPS-Q**)	17.5 ± 12.3	6.4 ± 7.9	<0.001
Exposure to childhood sexual	29.4%	6.7%	0.040
trauma (**CTES**)			
Sleep (**PROMIS- 8b**)	54.3 ± 10.3	43.8 ± 9.2	<0.001
Fatigue (**PROMIS- 7a**)	54.7 ± 9.6	46.0 ± 6.4	<0.001

*One OAB patient did not provide complete HADS-A data and was thus excluded from comparisons.

Table 2

Comparison of OAB/incontinence, anxiety and other psychosocial measures between OAB with anxiety versus OAB without anxiety (adjusted for age and sex)

	OAB with anxiety (HADS-A ≥8)	**OAB without anxiety (HADS-A <8)**	**p-value (adjusted for age and sex)**
Demographics:			
No. of subjects*	24	26	
Age (mean ± SD)	54.5 ± 11.1	53.1 ± 13.1	0.85
Sex (% females)	70.8%	73.1%	0.86
HADS-A scores	11.3 ± 2.9	3.9 ± 2.3	<0.001
Urinary questionnaires: (mean ± SD)			
ICIQ-UI (urinary incontinence, 0–21)	14.3 ± 4.6	10.3 ± 4.2	0.002
ICIQ-OAB (overactive bladder, 0–16)	10.3 ± 2.8	8.5 ± 2.3	0.011
OAB-q symptom bother subscale (6–36)	21.6 ± 6.1	17.1 ± 5.8	0.007
OAB-q quality of life subscale (13–78)	36.9 ± 17.7	22.6 ± 11.9	0.004
UDI-6 (urogenital distress inventory, 0–24)	15.3 ± 5.9	10.1 ± 4.3	0.001
IIQ-7 (incontinence impact questionnaire, 0–28)	12.7 ± 9	5.3 ± 5.6	0.001
Other psychosocial measures: (mean ± SD)			
Depression (**HADS-D**)	8.0 ± 3.5	2.5 ± 3.5	<0.001
Psychological stress level (**PSS**)	23.1 ± 6.3	11.8 ± 5.5	<0.001
Somatic symptom burden (**PSPS- Q**)	24.5 ± 11.3	11.0 ± 9.6	<0.001
Exposure to childhood sexual trauma (**CTES**)	37.5%	23.1%	0.162
Sleep (**PROMIS-8b**)	58.2 ± 10.1	50.7± 9.6	0.012
Fatigue (**PROMIS-7a**)	59.2 ± 8.8	50.5 ± 8.6	0.001

Table 3

Comparison of individual urinary symptoms (adjusted for age and sex)

	OAB with anxiety (HADS-A ≥8)	OAB without anxiety (HADS-A <8)	p-value (adjusted for age and sex)	Source of question
Incontinence symptoms:				
How often do you leak urine?[a]	3.8 ± 1.3	2.7 ± 1.2	0.003	ICIQ-UI question 3
How much urine do you usually leak?[b]	3.4 ± 1.6	2.2 ± 1.1	0.002	ICIQ-UI question 4
Does urine leak before you can get to the toilet?[c]	2.5 ± 0.9	2.0 ± 0.7	0.022	ICIQ-OAB question 6a
Frequency symptoms:				
How many times do you urinate during the day?[d]	2.0 ± 1.4	1.5 ± 1.0	0.061	ICIQ-OAB question 3a
During the night, how many times do you have to get up to urinate, on average?[e]	2.8 ± 1	2.5± 1.1	0.366	ICIQ-OAB question 4a
Numeric rating scale of **frequency** (0–10)	7.1 ± 2.6	5.9 ± 2.3	0.084	
Urgency symptoms:				
Do you have to rush to the toilet to urinate?[f]	2.9 ± 0.8	2.5 ± 0.9	0.056	ICIQ-OAB question 5a
Numeric rating scale of **urgency** (0–10)	6.9 ± 2.8	5.5 ± 2.1	0.049	
USS (urgency severity scale, 0–3)[g]	2.3 ± 0.7	2 ± 0.7	0.134	USS is a 4- point self- reported rating scale of the degree of urgency sensation (none, mild, moderate, severe).[g]

Based on the categories of response on the ICIQ questionnaire:

[a]How often do you leak urine? 0=never, 1=about once a week or less often, 2=two or three times a week, 3=about once a day, 4=several times a day, 5=all the time.

[b]How much urine do you usually leak? 0=none, 2=a small amount, 4=a moderate amount, 6=a large amount.

[c]Does urine leak before you can get to the toilet? 0=never, 1=occasionally, 2=sometimes, 3=most of the time, 4=all of the time.

[d]How many times do you urinate during the day? 0=1 to 6 times, 1=7 to 8 times 2=9 to 10 times, 3=11 to 12 times, 4=13 or more times.

[e]During the night, how many times do you have to get up to urinate, on average? 0=none, 1=one time, 2=two times, 3=three times, 4=four or more times

[f]Do you have to rush to the toilet to urinate? 0=never, 1=occasionally, 2=sometimes, 3=most of the time, 4=all of the time.

[g]Urgency severity scale (USS) reference: Nixon, A., Colman, S., Sabounjian, L. et al.: A validated patient reported measure of urinary urgency severity in overactive bladder for use in clinical trials. J Urol, **174:** 604, 2005.

Table 4

Spearman's correlation analyses between the severity of anxiety symptoms (HADS-A, range 0–21) and OAB/ incontinence symptoms.

	Spearman's correlation coefficient	**p-value (multivariate linear regression, adjusted for age and sex)**
Urinary questionnaires:		
ICIQ-UI (urinary incontinence, 0– 21)	0.41	0.003
ICIQ–OAB (overactive bladder, 0–16)	0.34	0.009
OAB-q symptom bother subscale (6–36)	0.29	0.021
OAB-q quality of life subscale (13–78)	0.40	0.006
UDI-6 (urogenital distress inventory, 0–24)	0.37	<0.001
IIQ-7 (incontinence impact questionnaire, 0–28)	0.47	<0.001
Other psychosocial measures:		
Depression (**HADS-D**)	0.77	<0.001
Psychological stress level (**PSS**)	0.82	<0.001
Somatic symptom burden (**PSPS- Q**)	0.47	0.001
Sleep (**PROMIS-8b**)	0.38	0.003
Fatigue (**PROMIS-7a**)	0.50	<0.001