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Original Article

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ABSTRACT

Interstitial cystitis/bladder pain syndrome (IC/BPS) is a chronic, debilitating condition characterized by persistent pelvic pain and lower urinary tract symptoms (LUTS). The prevalence of IC/BPS in Japan may be greater than previously estimated. The goal of this cross-sectional study was to estimate IC/BPS prevalence and its effect on health-related quality of life (HRQoL). A total of 6,210 participants participated in the Japan Community-based Cohort Study 2023 (JaCS2023). The questionnaire comprised 146 items covering demographics, LUTS, QoL, and healthcare utilization. Participants were categorized based on LUTS and bladder pain: IC/BPS and Non-IC/BPS controls. Prevalence of IC/BPS was 0.601%, with higher prevalence in females. IC/BPS patients exhibited significantly lower HRQoL, with mental health and sleep/energy being the most severely affected. The majority of symptomatic individuals remained undiagnosed and untreated. Additionally, patients with IC/BPS demonstrated localized bladder pain and a broad spectrum of storage and voiding dysfunction. These findings indicate that the prevalence of IC/BPS in Japan may be substantially greater than previously estimated. Addressing this treatment gap, wherein the majority of patients remain undiagnosed, is essential to mitigate its profound effect on HRQoL. Early identification and intervention guided by precise epidemiological estimations are critical for managing this disease.

Keywords: prevalence, epidemiology, health-related quality of life, chronic pelvic pain syndrome, healthcare utilization

INTRODUCTION

Interstitial cystitis/bladder pain syndrome (IC/BPS) is a chronic, debilitating condition characterized by persistent pelvic pain and lower urinary tract symptoms (LUTS)[1]. The prevalence of IC/BPS varies widely between Western countries, but is generally much higher than those in Japan, often estimated between 300 and 500 per 100,000 individuals, with a strong female predominance typically ranging from 5:1 to 10:1[2]. Despite its profound impact, global prevalence estimates remain highly inconsistent, largely because of the divergent diagnostic philosophies of the American Urological Association (AUA)[2], the International Society for the Study of Interstitial Cystitis (ESSIC) [3,4], and the Japanese Continence Society [1]. Although the AUA[2] and ESSIC[3,4] favor broader, symptom-based definitions, Japanese guidelines prefer a more stringent distinction, emphasizing the presence of Hunner lesions for a definitive diagnosis of IC by cystoscopy. This raises the critical question of whether the prevalence of IC/BPS is lower in Japan than in Western countries. In 2015, Yamada *et al.* [5] estimated the number of patients undergoing treatment for IC/BPS in Japan to be approximately 4,500. The prevalence of treated IC/BPS is just 4.5 per 100,000 population (0.004%), which underscores the need to reevaluate the true epidemiological burden in the modern Japanese context.

Patients with IC/BPS frequently experience depressive symptoms and diminished health-related quality of life (HRQoL)[6,7]. Many individuals with chronic bladder pain may remain undiagnosed or hesitate to seek specialized care because of the sensitive nature of the symptoms or lack of awareness regarding the latest Japan Community-based Cohort Study 2023（JaCS2023）diagnostic pathways[8]. Thus, evaluating the impact of IC/BPS on HRQoL and actual healthcare-seeking behaviors in individuals is necessary.

The high-quality, large-scale population-based databases offer new opportunities to resolve this

ambiguity. In 2023, the Japanese Continence Society conducted a nationwide Internet-based survey on LUTS, the JaCS2023, which was strategically designed to align with Japan's current demographics[8]. Using this comprehensive database, estimating the prevalence of IC/BPS in Japan with unprecedented precision is possible.

Therefore, in this study, we estimated the prevalence of IC/BPS in the Japanese population using the JaCS2023 database. We also investigated the correlation between the diagnostic subtype and HRQoL, clinical journey, and healthcare-seeking patterns, highlighting the severity of the disease in the Japanese population.

RESULTS

Study Population and Disease Classification

The flow of participants through the eligibility assessment and classification is shown in Figure 1. Among the 6,210 participants, 144 (2.32%) met the criteria for CPPS (bladder pain and discomfort at least once per week), of whom 143 (99.3%) had concurrent LUTS. Of the 143 participants, 106 (74.1%) reported urinary incontinence and were excluded, leaving 37 participants classified as having IC/BPS. The remaining 6,173 participants comprised the Non-IC/BPS group (Table 1).

Demographic and Clinical Characteristics

The baseline characteristics are summarized in Table 1. The IC/BPS group was significantly younger than the Non-IC/BPS group (median 42.0 [IQR 31.0–59.0] vs. 54.0 [39.0–70.0] years; $p = 0.016$). BMI values were implausible in 14 participants (0.2%) and were treated as missing, leaving 6,196 participants for the BMI comparison. BMI, Overactive Bladder Symptom Score, sex distribution, and lifestyle variables did not differ significantly between the groups, although the proportion of children was lower in the IC/BPS group, being close to statistical significance

(45.9% vs. 62.0%; p = 0.060).

Frailty-related indicators were consistently more prevalent in the IC/BPS group, including Eastern Cooperative Oncology Group Performance Status (ECOG) Performance Status ≥ 1 (37.8% vs. 14.5%; p < 0.001), self-reported poor general health (27.0% vs. 12.0%; p = 0.010), weight loss (37.8% vs. 21.9%; p = 0.027), and a history of falls (40.5% vs. 20.9%; p = 0.007). Depression/anxiety disorder (16.2% vs. 6.4%; p = 0.030) and a prior diagnosis of an OAB (24.3% vs. 11.8%; p = 0.035) were also more common. No significant differences were observed in hypertension, dyslipidemia, diabetes mellitus, or other comorbidities.

Population-Weighted Prevalence Estimates

On the basis of the 2023 Japanese population estimates, the prevalence of IC/BPS was 0.601% (95% CI 0.41–0.80%), corresponding to an estimated 614,441 affected individuals nationwide (95% CI 415,978–812,905) (Table 2). The estimated number of IC/BPS was slightly higher among women (328,586) than among men (285,856). Age- and sex-specific estimates are presented in Supplementary Table S1, and an exploratory subdivision according to pain intensity is presented in Supplementary Table S2.

HRQoL

Symptom-related impairment in HRQoL (Q34) was substantially greater in the IC/BPS group across all domains (Table 3, Figure 2). At the threshold of any impact (Q34 ≥ 2), the IC/BPS group reported markedly higher rates of impairment in mental health (48.6% vs. 10.3%), sleep/energy (45.9% vs. 11.2%), and overall daily life (35.1% vs. 12.3%) (all p < 0.001), as well as in work/household duties, physical activities, social relationships, and sexual life (all p ≤ 0.002). The same pattern persisted at the more severe threshold (Q34 ≥ 3).

Healthcare Utilization

Healthcare utilization did not differ significantly between the groups (Table 4). Only 5.4% of the IC/BPS group were currently receiving treatment, and 13.5% reported a past healthcare visit, compared with 3.9% and 7.2% in the Non-IC/BPS group, respectively. The proportion of patients who had visited a healthcare facility for urinary symptoms (18.9% vs. 11.0%; $p = 0.181$) and the proportion who had never sought care (81.1% vs. 89.0%; $p = 0.181$) did not reach statistical significance. The two IC/BPS participants currently receiving treatment attended the urology department.

LUTS Profile

The LUTS profiles differed markedly among the groups (Table 1, Figure 3). Voiding and post-micturition symptoms were strongly associated with the IC/BPS group, including incomplete emptying (54.1% vs. 14.0%), weak urinary stream (48.6% vs. 21.3%), hesitancy (43.2% vs. 11.3%), and intermittency (40.5% vs. 13.3%) (all $p < 0.001$). Nocturia (78.4% vs. 61.0%; $p = 0.041$) and urgency (24.3% vs. 12.0%; $p = 0.037$) were more frequent in the IC/BPS group, whereas the daytime frequency did not differ significantly. Urgency and stress urinary incontinence were absent in the IC/BPS group by definition, and these were applied as the exclusion criteria.

Criterion Validity

Of the 37 participants classified as having IC/BPS, one (2.7%) reported a prior physician diagnosis of IC. This individual fell within the high pain-intensity subset (Supplementary Table S2).

DISCUSSION

This cross-sectional study was conducted to describe IC/BPS cases in Japan, and provided the following findings. First, the prevalence of IC/BPS cases was 0.601% (601 per 100,000 individuals), representing an estimated 614,441 individuals according to Japanese population

figures in 2023. Among IC/BPS cases, female-sex was slightly predominated. To the best of knowledge, our estimates are most precise. Second, patients with IC/BPS had a lower HRQoL than that of Non-IC/BPS controls. Mental health, sleep/energy, and sexual activities were more prevalent in IC/BPS cases compared with non- IC/BPS controls. Third, most patients with IC/BPS did not seek medical care.

IC/BPS is clinically categorized as Hunner- and non-Hunner-type BPS. Because of its severe inflammatory nature and significant impact on patient welfare, Hunner-type IC has been officially designated as an intractable disease by the Japanese Ministry of Health, Labour and Welfare[9]. In the present study, patients with IC/BPS were significantly younger (42.0 years) than the non- IC/BPS controls (54.0 years) and had also significantly decreased ECOG-PS, weight loss, falls, and depression/anxiety. This designation reflects the greater clinical severity and refractory nature of IC/BPS. No significant differences in lifestyle diseases, such as hypertension, dyslipidemia, or diabetes mellitus, were observed. Our findings indicate that IC/BPS is associated with a significant decline in systemic physical activity and overall vitality. This reduction in daily functioning suggests that the impact of the disease extends far beyond the bladder, and it manifests as a state of generalized functional impairment.

The significant discrepancy in the prevalence rates is primarily a reflection of divergent diagnostic gatekeeping rather than geographical pathology. Although the AUA[2,10] estimates a high prevalence of 300–1,900 per 100,000 individuals based on broad symptom-based criteria, the Japanese Continence Society[1,5] reports a much lower prevalence of approximately 1.2–4.5 per 100,000, focusing almost exclusively on pathologically confirmed Hunner-type IC. However, their study was based on a clinical survey that exclusively counted patients currently undergoing treatment at major specialized institutions [5]. The ESSIC bridges this gap by offering a

standardized classification system that acknowledges both clinical symptoms and objective findings. According to the ESSIC proposal[3,4], the prevalence estimates in Europe typically range from eight to 300 per 100,000 people. The lower end of this spectrum reflects strictly defined cases involving positive biopsies (type 3) or classic Oravisto-type findings[11], whereas the higher end encompasses a broader BPS phenotype. In the present study, the prevalence of IC/BPS was estimated at 601 per 100,000 individuals. The results of our study aligned more closely with the ESSIC criteria, showing a prevalence that fell within the ESSIC-reported range of 8–300 per 100,000[3,4]. We have also confirmed reliability in this study by sensitivity analysis using more stringent IC/BPS criteria (bladder pain ≥ 3 and bladder discomfort ≥ 3; data not shown).

IC/BPS has a profound negative impact on HRQoL across multiple domains, including physical functioning, emotional well-being, and social interactions[7]. The burden of chronic pelvic pain and urinary frequency leads to significant sleep interference and psychological distress, which are critical determinants of a patient's overall quality of life[6]. In the present study, patients with IC/BPS also reported the highest rates of HRQoL impairment. Mental health and sleep/energy were the most frequently affected domains in patients with IC. To explain why IC/BPS affects these specific domains, the underlying pathophysiology, specifically the vicious cycle of chronic pain, inflammation, and autonomic dysfunction, must be examined[12]. A critical distinction in the classification of IC/BPS lies in the presence or absence of Hunner lesions. As noted by Akiyama and Hanno[13], these two subtypes differ in their histopathological features, such as chronic inflammatory infiltration, and in their clinical severity and responsiveness to targeted bladder treatment. Neuroimaging studies have demonstrated significant structural alterations in limbic regions, specifically the anterior cingulate cortex and insula, which correlate with the duration and intensity of bladder pain. This neuroanatomical remodeling supports the concept that

IC/BPS is a centralized pain syndrome, regardless of the initial peripheral insult[14]. Even in patients with confirmed Hunner lesions, functional magnetic resonance imaging (fMRI) has revealed increased functional connectivity between the somatosensory cortex and the limbic system (amygdala and insula) [15]. Overall, these findings suggest that chronic peripheral inflammation in IC/BPS eventually drives central sensitization, leading to emotional and cognitive deficits, as observed in the HRQoL scores in this study.

A critical challenge in the management of IC/BPS is the remarkably low rate of treatment-seeking behaviors among affected individuals. Among the IC/BPS cases, 13.5% reported a history of healthcare visits, and 5.4% were currently receiving treatment. These results suggest substantial underdiagnosis and undertreatment of IC/BPS in Japan. According to the 2023 Japan Community Health Survey (JaCS 2023), only 4.9% of patients with OAB symptoms seek medical consultation[8]. This substantial treatment gap may be attributed to several barriers: many patients remain unaware of which specialized department to visit, while others mistakenly perceive their symptoms as a normal part of aging or choose to leave them untreated because of a lack of disease awareness. Given that 100% of the treated IC cases are managed within urology departments, public health initiatives based on accurate epidemiological data are urgently needed to promote disease awareness and guide symptomatic individuals toward appropriate urological consultations.

Hunner-type IC represents a clear inflammatory phenotype characterized by severe mucosal damage, whereas non-Hunner-type BPS remains more etiologically complex[16]. Thus, IC/BPS is increasingly recognized not as an isolated bladder disease but as part of a systemic central sensitivity syndrome. It frequently co-occurs with other chronic pain conditions, most notably fibromyalgia and irritable bowel syndrome[17,18], suggesting a shared pathophysiological mechanism rooted in heightened neural processing, known as organ crosstalk[19]. Patients often

present with a broad spectrum of LUTS beyond simple bladder pain, including severe urgency, increased daytime frequency, and debilitating nocturia[9]. In the present study, patients with IC/BPS predominantly presented with storage and voiding symptoms, particularly nocturia, urgency, and incomplete emptying. An OAB diagnosis was more prominent in IC/BPS cases than in non-IC/BPS cases (24.3% vs. 11.8%).

Although we believe that this study provided useful evidence on IC/BPS, this study had several limitations that should be acknowledged. First, because it was an Internet-based survey, no information regarding the participants' treatment was available. However, among the 37 participants classified as having IC/BPS, only one (2.7%) reported a prior diagnosis of IC. Second, the diagnostic criteria for IC/BPS vary by country, and because cystoscopy was not performed in this study, we could not distinguish between Hunner and non-Hunner types. Third, incontinence was excluded from the IC/BPS classification to minimize diagnostic contamination from OAB and other incontinence-associated conditions. As IC/BPS progresses, especially in the Hunner type, bladder capacity decreases, which can lead to incontinence and potentially indicates the need for cystectomy. However, the JaCS 2023 population was expected to include fewer severe IC/BPS cases. The high rate of incontinence exclusion (74.1%) was noteworthy, suggesting that excluding patients with incontinence using the IC/BPS criteria is feasible. Fourth, because IC/BPS cases were defined based on the presence of moderate or severe bladder pain and discomfort ($Q20 \geq 2$ and $Q22 \geq 2$), completely excluding patients with acute cystitis or prostatitis is difficult. This may explain why our findings showed only a slight female predominance despite IC/BPS being traditionally regarded as a disease that is significantly more common in women. Finally, the cross-sectional design cannot guarantee a cause and effect relationship between characteristics and IC/BPS.

In conclusion, this study showed that the prevalence of IC/BPS was 0.601% (601 per 100,000 individuals) in the Japanese population, revealing a significant treatment gap in which the majority of affected individuals remain undiagnosed or untreated. Our findings underscore that IC/BPS is not merely a localized bladder condition but a systemic disorder that profoundly impacts HRQoL, particularly in the domains of mental health and sleep.

METHODS

Study Design and Population

This cross-sectional study used data from a nationwide survey on LUTS conducted by the Japanese Continence Society, the 2023 Japan Community Health Survey (JaCS 2023). Detailed survey methods are described elsewhere[8,20]. Briefly, an online survey was conducted among individuals aged 20 years or older who were anonymously registered with the web panel of a Japanese online research company (Macromill, Inc., Tokyo, Japan). The survey was originally planned to enroll 6,000 persons selected by probability sampling based on the composition of the Japanese population according to the National Census of the Statistics Bureau of the Ministry of Internal Affairs and Communications in 2020[21]. Of the 43,256 people who were surveyed, 6,210 adults (14.4%; 3,122 men and 3,088 women) participated. They provided informed consent by opting in. The self-administered questionnaire consisted of 48 questions including demographic characteristics, LUTS, bladder pain, quality of life, and treatment-seeking behaviors. Because several questions contained multiple sub-items, they were expanded to 146 item-level variables in the analytic dataset. All symptoms and QoL items were based on the preceding month. All procedures involving human participants were approved by the Ethics Committee of the University of the Ryukyus (approval number: #25-2510-00-00-00, approved on August 4, 2025) and were conducted in accordance with the Declaration of Helsinki and relevant national ethical guidelines.

Definitions

In this study, we used a single clinical entity of IC/BPS rather than IC and BPS separately on the basis of bladder pain symptom intensity. This approach reflects the current consensus that symptom-based criteria cannot reliably distinguish IC from BPS in the absence of cystoscopic evaluation[4] and is consistent with the contemporary nomenclature that regards IC/BPS as a single symptom syndrome[2].

Chronic pelvic pain syndrome (CPPS) was defined as the co-occurrence of bladder (lower abdominal) pain at least once per week (Q19 ≥ 3) and bladder (lower abdominal) discomfort or heaviness at least once per week (Q21 ≥ 3). LUTS were defined as the presence of at least one of the following: daytime urinary frequency ≥ 8 times/d (Q12 ≥ 4), nocturia ≥ 2 times/night (Q13 ≥ 2), urgency at least once per week (Q23 ≥ 3), weak urinary stream at least once per week (Q16 ≥ 3), intermittency at least once per week (Q18S1 ≥ 3), hesitancy at least once per week (Q18S2 ≥ 3), straining at least once per week (Q18S3 ≥ 3), or incomplete emptying at least once per week (Q31S1 ≥ 3). These thresholds were established in accordance with previous epidemiological studies using the JaCS2023 database[8,22]. Urinary incontinence was defined as the presence of urgency urinary incontinence (Q26 ≥ 2: any frequency of leakage) or stress urinary incontinence (Q28 ≥ 2: any frequency of leakage). Participants meeting the incontinence criteria were excluded from the IC/BPS classification to minimize diagnostic contamination from overactive bladder (OAB) and other incontinence-associated conditions.

Participants who met the criteria for CPPS, had concurrent LUTS, and did not report urinary incontinence were classified as having IC/BPS. The remaining patients comprised the Non-IC/BPS group. Although IC/BPS was treated as a single entity in the primary analysis, an exploratory subdivision by pain intensity was performed for supplementary prevalence estimates. Participants reporting moderate or severe bladder pain and discomfort (Q20 ≥ 2 and Q22 ≥ 2) were designated

as the higher pain-intensity (formerly “IC”) subgroup, and the remainder as the lower pain-intensity (“BPS”) subgroup. This subdivision is presented only for descriptive purposes and is not intended to imply that IC and BPS can be reliably distinguished based on the symptoms.

Population-Weighted Prevalence Estimation

Although the survey sample was allocated according to the 2020 National Census, we estimated population-based prevalence using 2023 Japanese population estimates, such that the results reflect the number of IC/BPS cases in the Japanese population at the time of the survey. The 2023 Japanese population estimates stratified by 10-year age groups and sex for Japanese nationals obtained from the Statistics Bureau of Japan as of January 1, 2023[21]. The study sample was stratified by 10-year age groups (20–29 to 90–99 years) and sex. The sample prevalence for each stratum was calculated and applied to the corresponding figures for the Japanese population. The overall weighted prevalence was computed as the sum of stratum-specific estimated cases divided by the total reference population. The 95% confidence intervals (CIs) were estimated using the normal approximation (Wald) method for direct age- and sex-standardized prevalence.

Statistical Analysis

Demographic, clinical, lifestyle, and symptomatic variables were compared between the IC/BPS and Non-IC/BPS groups. Given the small size of the IC/BPS group, the normality of continuous variables was not assumed and was assessed using the Shapiro–Wilk test. Continuous variables are presented as medians (interquartile range [IQR]) and were compared using the Mann–Whitney U test. Categorical variables are presented as numbers (percentages) and were compared using a chi-square test. Self-reported height and weight were screened for reporting errors before calculating body mass index (BMI), as extreme BMI values in this survey have previously been regarded as likely inappropriate responses [23]. Records in which height and weight appeared to

have been transposed were corrected, and values remaining below 12 or above 50 kg/m² were considered data entry errors and treated as missing for the BMI analyses. Participants with missing BMI were retained in all other analyses. The same statistical framework was applied to the HRQoL, healthcare utilization, and LUTS profiles.

Criterion Validity

The criterion validity of the symptom-based definition was assessed by examining the concordance between algorithmically classified IC/BPS cases and participants who self-reported a prior physician diagnosis of IC. Self-reported diagnoses were ascertained using a free-text item that asked about other major medical conditions.

All statistical analyses were performed using Python (pandas, scipy, and Statsmodels libraries) and were verified using JMP Student's Edition (version 19; JMP Statistical Discovery LLC, Cary, NC, USA). Statistical significance was defined as a two-sided p-value <0.05. This study adhered to the STROBE guidelines for observational studies.

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Author contributions

M. M.*: conceptualization, methodology, formal analysis, investigation, visualization, writing − original draft, writing − review and editing. T.A.*: conceptualization, formal analysis, investigation, visualization, writing − review and editing. *These two authors contributed equally to this work. M. K.: conceptualization, methodology, formal analysis, writing − review and editing. A. A.: methodology, formal analysis, writing − review and editing. K.N.: conceptualization, methodology, formal analysis, writing − review and editing. Y. K.: writing − review and editing. N. S.: writing − review and editing. T. M.: project administration, writing − review and editing. N. M.: supervision, writing − review and editing.

Competing interests

The authors declare no conflict of interest.

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Data availability statement

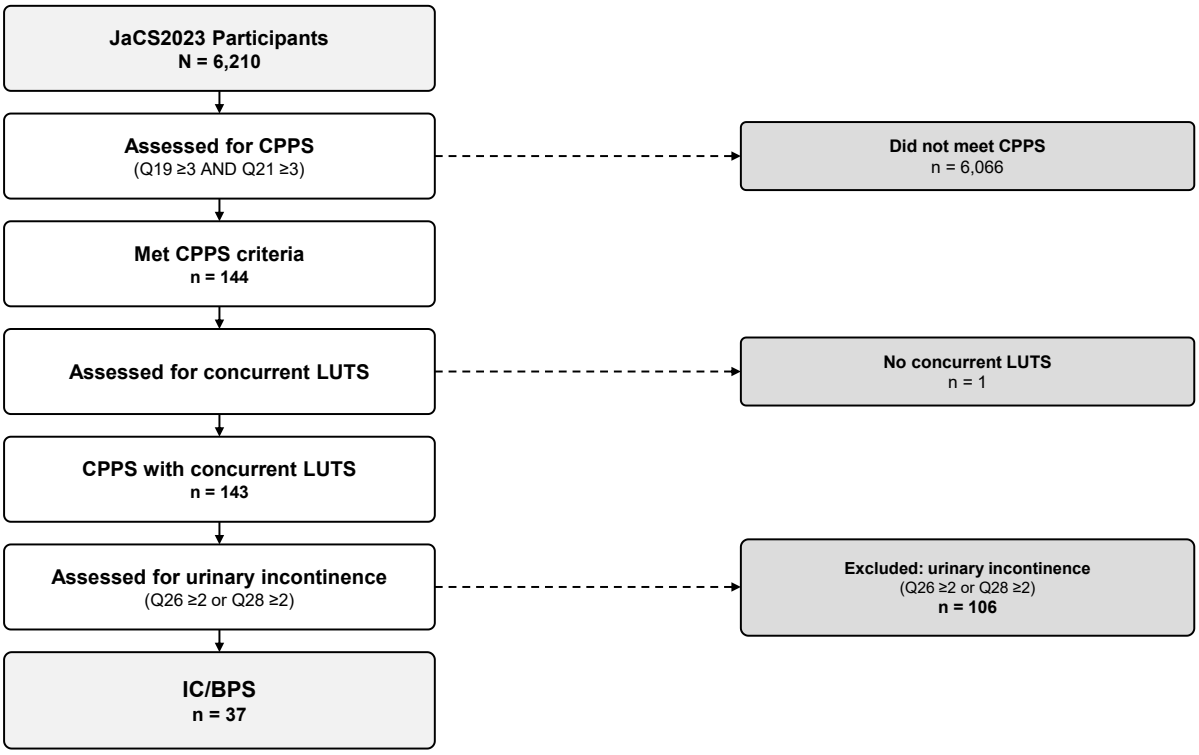
The datasets generated during and/or analysed during the current study are not publicly available due to regulations of the Institutional Review Board (the Nihon University Itabashi Hospital Clinical Research Judging Committee) but are available from the corresponding author on

reasonable request.

Institutional Review Board Statement

All procedures involving human participants were conducted in accordance with the ethical standards of the institutional committee (Ethics Committee of the University of the Ryukyus, #25-2510-00-00-00, August 4, 2025) and was conducted in accordance with the Declaration of Helsinki (2013 revision) and the Ethical Guidelines for Medical and Biological Research Involving Human Subjects issued by the Ministry of Education, Culture, Sports, Science and Technology; Ministry of Health, Labor and Welfare; and Ministry of Economy, Trade and Industry of Japan (2021).

FIGURE LEGENDS

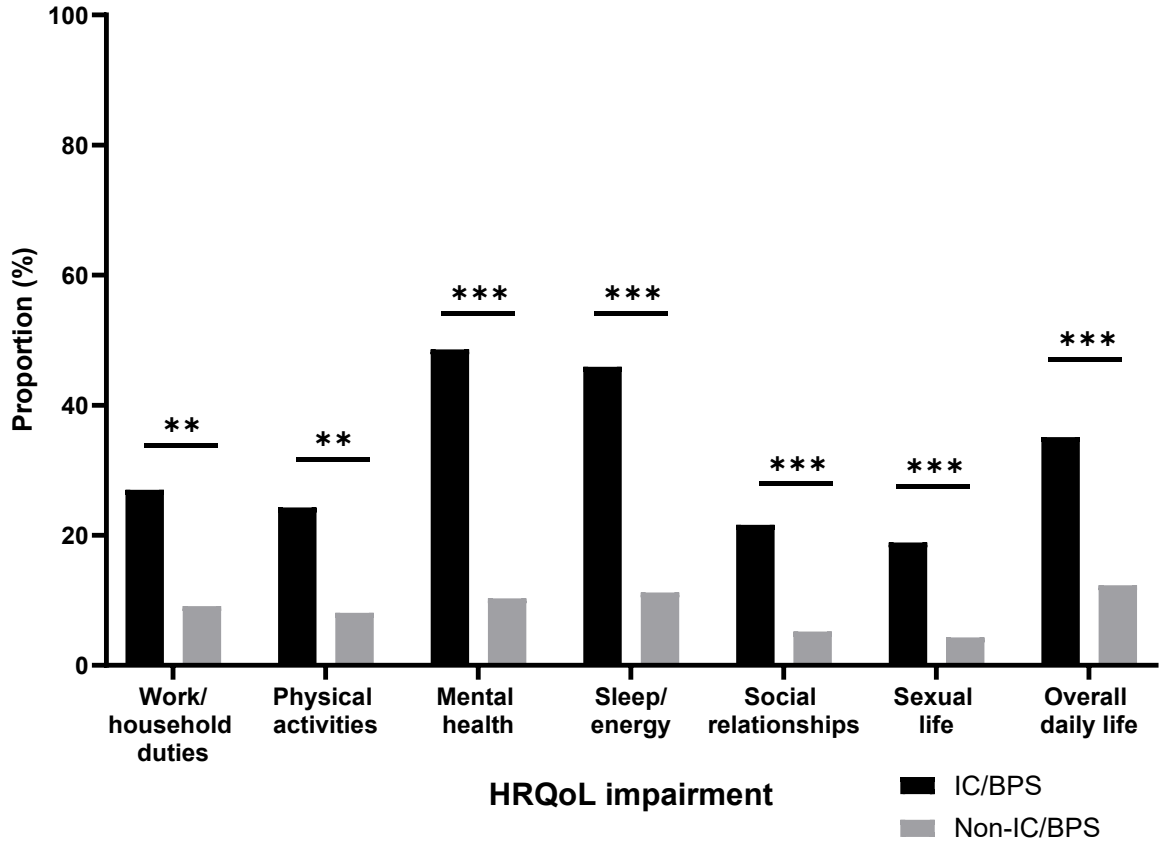


CPPS: Chronic Pelvic Pain Syndrome LUTS: Lower Urinary Tract Symptoms IC/BPS: Interstitial Cystitis/Bladder Pain Syndrome

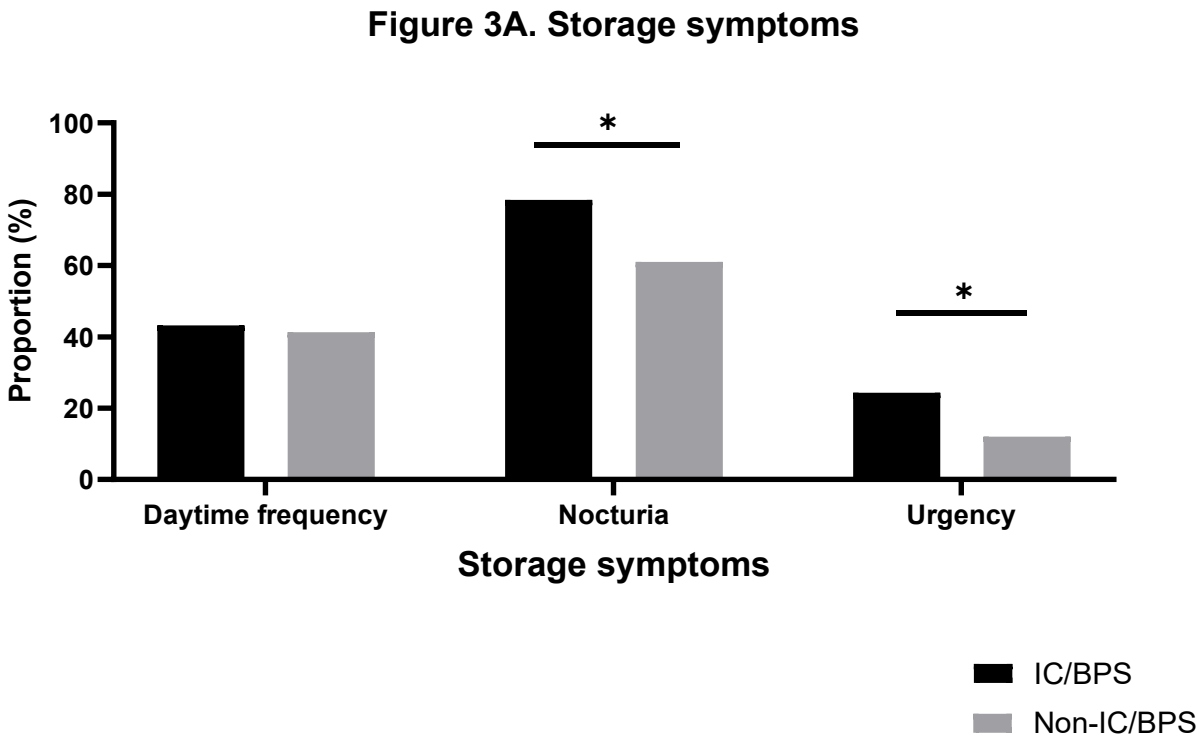
Figure 1. Flow diagram of participant selection and classification. Participants were classified into two groups (IC/BPS and Non-IC/BPS) using a symptom-based algorithm incorporating chronic pelvic pain and lower urinary tract symptoms, with urinary incontinence applied as an exclusion criterion, in the absence of cystoscopic evaluation. Percentages in parentheses are calculated relative to the preceding step. Population-weighted prevalence estimates are presented in Table 4. CPPS: chronic pelvic pain syndrome; LUTS: lower urinary tract symptoms; IC/BPS: interstitial cystitis/bladder pain syndrome.

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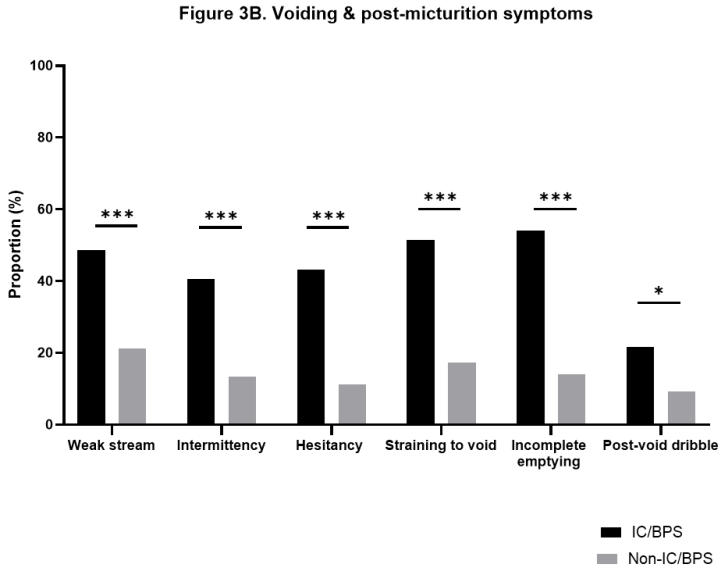
Figure 2. HRQoL impairment (Q34 >=2: any impact) - IC/BPS vs control



429
430 **Figure 2. Proportion of participants reporting any impact on health-related quality of life (Q34 ≥ 2)**
431 **in the IC/BPS and Non-IC/BPS groups, across seven HRQoL domains (work/household duties,**
432 **physical activities, mental health, sleep/energy, social relationships, sexual life, and overall daily life).**
433 **Black bars, IC/BPS; grey bars, Non-IC/BPS. Groups were compared using Fisher's exact test. **p <**
434 **0.01, ***p < 0.001. IC/BPS: interstitial cystitis/bladder pain syndrome; HRQoL: health-related**
435 **quality of life.**
436



437



438
439 **Figure 3. Prevalence of lower urinary tract symptoms (LUTS) in the IC/BPS and Non-IC/BPS groups.**
440 **Panel A, storage symptoms (daytime frequency, nocturia, urgency). Panel B, voiding and post-**
441 **micturition symptoms (weak urinary stream, intermittency, hesitancy, straining to void, incomplete**
442 **emptying, post-void dribble). Straining to void denotes the presence of straining to initiate, to**
443 **maintain flow, or to empty the bladder (Q18S3–S5 ≥ 3). Black bars, IC/BPS; grey bars, Non-IC/BPS.**
444 **Groups were compared using Fisher's exact test. *p < 0.05, ***p < 0.001. Daytime frequency did not**

differ significantly between groups. IC/BPS: interstitial cystitis/bladder pain syndrome; LUTS: lower urinary tract symptoms.

TABLES

Table 1. Baseline characteristics of the IC/BPS and Non-IC/BPS groups

Variable	All (N=6,210)	IC/BPS (n=37)	Non-IC/BPS (n=6,173)	P value
Continuous variables				
Age, years	54.0 [39.0-70.0]	42.0 [31.0-59.0]	54.0 [39.0-70.0]	0.016 *
BMI, kg/m² (n = 6,196)	22.0 [19.8-24.3]	21.4 [20.2-23.7]	22.0 [19.8-24.3]	0.644
OABSS	2.0 [1.0-3.0]	3.0 [1.0-3.0]	2.0 [1.0-3.0]	0.110
Demographics				
Female, n (%)	3088 (49.7%)	19 (51.4%)	3069 (49.7%)	0.870
Having children, n (%)	3843 (61.9%)	17 (45.9%)	3826 (62.0%)	0.060
Married, n (%)	3906 (62.9%)	26 (70.3%)	3880 (62.9%)	0.397
Lifestyle				
Alcohol history, n (%)	3624 (58.4%)	17 (45.9%)	3607 (58.4%)	0.134
Smoking history, n (%)	1570 (25.3%)	5 (13.5%)	1565 (25.4%)	0.128
Frailty indicators				
ECOG-PS >=1, n (%)	908 (14.6%)	14 (37.8%)	894 (14.5%)	<0.001 *
Poor general health, n (%)	751 (12.1%)	10 (27.0%)	741 (12.0%)	0.010 *
Weight loss, n (%)	1366 (22.0%)	14 (37.8%)	1352 (21.9%)	0.027 *
Reduced walking speed, n (%)	2265 (36.5%)	17 (45.9%)	2248 (36.4%)	0.235
Falls, n (%)	1303 (21.0%)	15 (40.5%)	1288 (20.9%)	0.007 *
Infrequent exercise, n (%)	3263 (52.5%)	18 (48.6%)	3245 (52.6%)	0.742
Comorbidities				
Hypertension, n (%)	1338 (21.5%)	9 (24.3%)	1329 (21.5%)	0.689
Dyslipidemia, n (%)	752 (12.1%)	4 (10.8%)	748 (12.1%)	1.000
Diabetes mellitus, n (%)	467 (7.5%)	2 (5.4%)	465 (7.5%)	1.000
Heart failure, n (%)	140 (2.3%)	0 (0.0%)	140 (2.3%)	1.000
Ischemic heart disease, n (%)	197 (3.2%)	1 (2.7%)	196 (3.2%)	1.000
Chronic kidney disease, n (%)	143 (2.3%)	2 (5.4%)	141 (2.3%)	0.209
Stroke, n (%)	153 (2.5%)	2 (5.4%)	151 (2.4%)	0.231
Spinal disorder, n (%)	171 (2.8%)	2 (5.4%)	169 (2.7%)	0.271
Neurological disease, n (%)	107 (1.7%)	1 (2.7%)	106 (1.7%)	0.475
Depression/anxiety, n (%)	402 (6.5%)	6 (16.2%)	396 (6.4%)	0.030 *
Sleep apnea syndrome, n (%)	209 (3.4%)	1 (2.7%)	208 (3.4%)	1.000
Insomnia, n (%)	452 (7.3%)	5 (13.5%)	447 (7.2%)	0.188
Fecal incontinence, n (%)	156 (2.5%)	2 (5.4%)	154 (2.5%)	0.238
Constipation, n (%)	704 (11.3%)	6 (16.2%)	698 (11.3%)	0.303
Storage symptoms				
Daytime frequency (Q12>=4), n (%)	2566 (41.3%)	16 (43.2%)	2550 (41.3%)	0.868
Nocturia (Q13>=2), n (%)	3793 (61.1%)	29 (78.4%)	3764 (61.0%)	0.041 *
Urgency (Q23>=3), n (%)	750 (12.1%)	9 (24.3%)	741 (12.0%)	0.037 *
Urgency incontinence (Q26>=2), n (%)	1131 (18.2%)	0 (0.0%)	1131 (18.3%)	<0.001 *

Stress incontinence (Q28>=2), n (%)	1195 (19.2%)	0 (0.0%)	1195 (19.4%)	<0.001 *
Voiding symptoms				
Weak stream (Q16>=3), n (%)	1335 (21.5%)	18 (48.6%)	1317 (21.3%)	<0.001 *
Intermittency (Q18S1>=3), n (%)	834 (13.4%)	15 (40.5%)	819 (13.3%)	<0.001 *
Hesitancy (Q18S2>=3), n (%)	713 (11.5%)	16 (43.2%)	697 (11.3%)	<0.001 *
Post-micturition symptoms				
Incomplete emptying (Q31S1>=3), n (%)	882 (14.2%)	20 (54.1%)	862 (14.0%)	<0.001 *
Post-micturition dribble (Q31S3>=3), n (%)	577 (9.3%)	8 (21.6%)	569 (9.2%)	0.018 *
OAB				
OAB diagnosis, n (%)	738 (11.9%)	9 (24.3%)	729 (11.8%)	0.035 *

Values are median [interquartile range] for continuous variables or n (%) for categorical variables. P values were calculated using the Mann–Whitney U test for continuous variables and Fisher's exact test for categorical variables, comparing the IC/BPS group with the Non-IC/BPS group. *p < 0.05. IC/BPS, interstitial cystitis/bladder pain syndrome; IQR, interquartile range.

Table 2. Population-weighted prevalence estimate of IC/BPS (2023 Japanese Population Estimates)

	Total IC/BPS
Sample n	37
Weighted prevalence (%)	0.601%
95% CI (prevalence)	0.41–0.80%
Estimated cases in Japan	614,441
95% CI (estimated cases)	415,978–812,905
Male	285,856
Female	328,586

Stratified by 10-year age group and sex (20–99 years). 95% CI calculated using the normal approximation (Wald) method for the directly age- and sex-standardized prevalence. An exploratory subdivision by pain intensity is presented in Supplementary Table S2.

Table 3. Health-related quality of life (HRQoL) by group

HRQoL domain (Q34)	All (N=6,210)	IC/BPS (n=37)	Non-IC/BPS (n=6,173)	P value
Q34 >=2: any impact				
Work/household duties	574 (9.2%)	10 (27.0%)	564 (9.1%)	0.001
Physical activities	507 (8.2%)	9 (24.3%)	498 (8.1%)	0.002
Mental health	656 (10.6%)	18 (48.6%)	638 (10.3%)	<0.001 *
Sleep/energy	711 (11.5%)	17 (45.9%)	694 (11.2%)	<0.001 *
Social relationships	327 (5.3%)	8 (21.6%)	319 (5.2%)	<0.001 *
Sexual life	271 (4.4%)	7 (18.9%)	264 (4.3%)	<0.001 *
Overall daily life	775 (12.5%)	13 (35.1%)	762 (12.3%)	<0.001 *
Q34 >=3:				
Work/household duties	122 (2.0%)	4 (10.8%)	118 (1.9%)	0.006
Physical activities	94 (1.5%)	3 (8.1%)	91 (1.5%)	0.018
Mental health	109 (1.8%)	6 (16.2%)	103 (1.7%)	<0.001 *
Sleep/energy	146 (2.4%)	6 (16.2%)	140 (2.3%)	<0.001 *
Social relationships	80 (1.3%)	3 (8.1%)	77 (1.2%)	0.012
Sexual life	79 (1.3%)	2 (5.4%)	77 (1.2%)	0.080
Overall daily life	129 (2.1%)	3 (8.1%)	126 (2.0%)	0.041

P values were calculated using Fisher's exact test for categorical variables, comparing the IC/BPS group with the Non-IC/BPS group. *p < 0.05. IC/BPS, interstitial cystitis/bladder pain syndrome; IQR, interquartile range.

Table 4 Healthcare utilization (Q39)

Healthcare utilization (Q39)	IC/BPS (n=37)	Non-IC/BPS (n=6,173)	P value
Currently receiving treatment	2 (5.4%)	239 (3.9%)	0.654
History of healthcare visit (past)	5 (13.5%)	443 (7.2%)	0.187
Never visited	30 (81.1%)	5,491 (89.0%)	0.181
Ever visited (current + past)	7 (18.9%)	682 (11.0%)	0.181

P values were calculated using Fisher's exact test for categorical variables, comparing the IC/BPS group with the Non-IC/BPS group. *p < 0.05. IC/BPS, interstitial cystitis/bladder pain syndrome; IQR, interquartile range.

Supplementary Analysis

Supplementary Table S1. Age- and sex-specific prevalence and estimated number of individuals with IC/BPS in Japan (10-year age groups, 20–99 years)

Age group	Sex	Sample n	Cases	Prevalence (%)	95% CI (%)	Reference population	Estimated cases in Japan	95% CI (cases)
20–29	Male	387	3	0.78	0.26–2.25	6,016,000	46,636	15,881–135,605
20–29	Female	344	6	1.74	0.80–3.75	5,762,000	100,500	46,197–216,219
30–39	Male	442	4	0.90	0.35–2.30	6,601,000	59,738	23,266–152,057
30–39	Female	396	3	0.76	0.26–2.20	6,352,000	48,121	16,386–139,960
40–49	Male	573	2	0.35	0.10–1.26	8,579,000	29,944	8,216–108,407
40–49	Female	518	5	0.97	0.41–2.24	8,301,000	80,125	34,281–185,899
50–59	Male	514	3	0.58	0.20–1.70	8,730,000	50,953	17,345–148,569
50–59	Female	476	2	0.42	0.12–1.52	8,588,000	36,084	9,902–130,444
60–69	Male	476	1	0.21	0.04–1.18	7,258,000	15,248	2,692–85,667
60–69	Female	462	0	0.00	0.00–0.82	7,510,000	0	0–61,932
70–79	Male	465	2	0.43	0.12–1.55	7,509,000	32,297	8,863–116,729
70–79	Female	502	0	0.00	0.00–0.76	8,755,000	0	0–66,490
80–89	Male	224	3	1.34	0.46–3.86	3,811,000	51,040	17,397–147,219
80–89	Female	321	2	0.62	0.17–2.24	5,855,000	36,480	10,014–131,325
90–99	Male	41	0	0.00	0.00–8.57	677,000	0	0–57,999
90–99	Female	69	1	1.45	0.26–7.76	1,882,000	27,275	4,823–146,105

Prevalence is the crude proportion within each age–sex stratum, with Wilson score 95% confidence intervals. Estimated cases were obtained by applying the stratum-specific prevalence to the corresponding Japanese population. The reference population is the Japanese national population as of January 1, 2023 (Statistics Bureau of Japan). The overall directly age- and sex-standardized prevalence and the estimated number of affected individuals nationwide are reported in Table 4.

Supplementary Table S2. Exploratory subdivision of the IC/BPS spectrum by pain intensity: population-weighted prevalence estimates

	IC (higher pain intensity)	BPS (lower pain intensity)	Total IC/BPS
Sample n	11	26	37
Weighted prevalence (%)	0.179%	0.423%	0.601%
95% CI (prevalence)	0.07–0.28%	0.26–0.59%	0.41–0.80%
Estimated cases in Japan	182,435	432,007	614,441
95% CI (estimated cases)	74,635–290,234	265,036–598,977	415,978–812,905
Male	30,480	255,376	285,856
Female	151,955	176,631	328,586

The higher pain-intensity subgroup was defined as bladder pain and discomfort of moderate or greater severity (Q20 ≥ 2 and Q22 ≥ 2), and the lower pain-intensity subgroup as the remainder. Prevalence was directly standardized to the Japanese national population as of January 1, 2023 (Statistics Bureau of Japan) by 10-year age group and sex (20–99 years), with 95% CIs calculated using the normal approximation (Wald) method. This subdivision is exploratory and descriptive only. Current consensus holds that IC and BPS cannot be reliably distinguished on the basis of symptom intensity in the absence of cystoscopic evaluation, and IC/BPS was therefore analysed as a single entity throughout the primary analyses.