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ORIGINAL ARTICLE

Development and validity of a questionnaire for coital urinary incontinence: clinical and urodynamic analysis

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Abstract

Introduction and hypothesis To develop and validate a questionnaire (coital incontinence questionnaire-CIQ) for CI and perform clinical and urodynamic analysis of patients with CI.

Methods A total of 414 female patients with urinary incontinence undergoing urodynamics were included in this study. All patients were evaluated with a detailed history, questionnaires, physical examination, relevant laboratory tests and urodynamics. Content, construct and convergent validity of the questionnaire were evaluated. Patients were divided into groups: with CI (group 1) and without CI (group 2).

Results Overall test-retest reliability coefficients of CIQ were high ($r = 0.968$, $p = 0.01$), and the internal consistency was excellent (Cronbach's alpha, 0.964). The test-retest scores did not show a statistically significant difference ($p = 0.158$). Approximately 34% of these women had CI. Body mass index (BMI), parity, daily incontinence episodes, daily pad counts and 1-h pad test results were higher in group 1 than group 2 ($p < 0.05$). Multivariate analysis revealed that a daily incontinence episode, BMI, maximum cystometric capacity and PdetQmax were statistically significant factors associated with CI. Urinary incontinence types were different between groups ($p < 0.0001$). Incontinence with both penetration and orgasm was the most common form of CI (54.4%), and CI severity differed significantly among the forms of CI ($p = 0.007$). CI negatively interferes with patients' sexual life, their relationship with their partner and quality of life in most patients.

Conclusions The CIQ is a reliable, valid and useful tool for assessment of all aspects of CI in women. CI seems to be related to the severity of urinary incontinence. Further studies are needed to clarify this subject.

Keywords Coital incontinence · Quality of life · Questionnaire · Sexuality · Urodynamics · Validation

Introduction

The symptom of coital incontinence (CI) was defined as a complaint of involuntary urine leakage during the act of sexual intercourse [1]. Two forms of CI occurring with vaginal penetration or occurring with orgasm are accepted [1]. The population prevalence of CI was reported as 2% [2]. In the literature, the prevalence of CI in urinary incontinent women has been reported to range between 10.6% and 66.7% [3–17]. However, CI is a common but underreported symptom [3, 16].

CI is reported to have a negative impact on female sexuality and quality of life (QoL) [5–8, 14]. Despite the high prevalence of this symptom and its important impact on female QoL, and on sexuality in particular, our knowledge about the pathophysiology, diagnosis and treatment of CI is still poor [3, 11, 18].

A few studies have been carried out analyzing the prevalence of urine leakage during sexual intercourse and measuring its impaction on sexual function using validated instruments [5, 7, 18]. However, no validated specific questionnaires to assess CI are currently in use.

The objective of this study was to develop and validate a new questionnaire (coital incontinence questionnaire-CIQ) to measure the severity of CI and to investigate the forms and effects of CI on sexual function and quality of life.

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Methods

Study design

A total of 792 consecutive female subjects with urinary incontinence who had been referred to our urodynamic unit and subsequently underwent urodynamics between May 2014 and May 2016 were assessed for participation in this study. Three hundred seventy-eight subjects were excluded because they did not meet the inclusion criteria ($n = 281$) and refused to participate ($n = 97$). A total of 414 sexually active heterosexual women were included in the study. The study was approved by the Institutional Review Board (24/09/2013–2), and written informed consent to participate in this study was obtained from each patient before enrollment.

The study inclusion criteria were age ≥ 18 years, married and sexually active women with urinary incontinence, and the ability to communicate, understand and comply with the study requirements. The exclusion criteria were no sexual activity, use of any medication for the treatment of lower urinary tract symptoms, bladder stone, bladder outflow obstruction, recent lower urinary tract instrumentation, neurogenic lower urinary tract dysfunction, presence of urinary tract infection, malignancy, pregnancy, inability to read the questionnaire, cognitive impairment or psychiatric morbidity, and failure to give consent. Patients who had had previous pelvic surgery, radiotherapy or cancer chemotherapy were also excluded. Additionally, patients who had incontinence complaints but were urodynamically normal and who could not micturate during the pressure flow study were excluded from the study.

Development and validation of CIQ

Development of the questionnaire involved two stages: formation of the content and psychometric analysis. Several steps were used to develop the content of the questionnaire. In the first stage, a systematic literature review was conducted using the keywords coital incontinence, sexual incontinence, urinary incontinence and questionnaire. After that, the first and second authors formed the first draft of the questionnaire. The draft was distributed to five experts working in the fields of urology, gynecology and public health. Taking into consideration the feedback received from the experts, some questions were excluded or changed, some others were added, and the second draft was developed. Afterwards, questions were pilot tested in a group of patients with CI ($n = 25$), and the draft was revised; questions that were not clear were either removed or changed. This patient group was also evaluated for urinary incontinence by history, physical examination and urodynamic investigation. Finally, a 13-item pool was generated and reduced to 9 questions as the final questionnaire (Appendix 1). Subsequently, the final 9-item questionnaire was validated using the data from a data set of 323 women with urinary incontinence based on urodynamic diagnosis. Several studies were undertaken to evaluate the psychometric properties of the questionnaire, including the content, construct and convergent validity. Additionally, to assess reproducibility, the scale was applied to 91 participants twice with a 2-week interval for test-retest reliability.

Clinical and urodynamic analysis of patients

All patients ($n = 414$) were evaluated before urodynamic testing according to the protocol with a detailed history including demographic details (body mass index, smoking status, Charlson Comorbidity Index, parity), depression, sexual life, lower urinary tract symptoms and CI. All patients were also asked to fill out the International Consultation on Incontinence Questionnaire-Urinary Incontinence Short Form (ICIQ-UI SF) [19], Pelvic Organ Prolapse/Urinary Incontinence Sexual Questionnaire-Short Form (PISQ-12) [20], Incontinence Impact Questionnaire-Short Form (IIQ-7) [21], Urinary Distress Inventory-Short Form (UDI-6) [21], Overactive Bladder Screener (OAB -V8) [22], Female Sexual Function Inventory (FSFI) [23] and CIQ before the urodynamic investigation. Bladder diary (3 days), pad test (1 h), pelvic physical examination (POPQ, pelvic muscle activity-Oxford grading), Q-tip test, urinalysis, urine culture, postvoid residual urine volume (PVR) assessment and urodynamics were also performed for all patients. Pelvic organ prolapse (POP), described according to the POP quantification (POP-Q) system, was assessed in the lithotomy position while the patients were exerting a maximal Valsalva maneuver. All women were examined by the same trained urologist. Patients were divided into two groups based on the response to CIQ: women with CI (group 1) and women without CI (group 2).

For the urodynamic investigation, a Solar system (Medical Measurement System, Enschede, The Netherlands) was used. All women underwent free flow uroflowmetry, filling cystometry and pressure flow studies. The methods, definitions and units conform to the standards jointly recommended by the International Urogynecological Association and the International Continence Society, except where specifically noted [1]. Cystometry was performed using dual-lumen 7-F urethral and 7-F rectal catheters (air charged) with the woman in the sitting and standing positions. The bladder was filled with normal saline at body temperature starting at the physiological filling rate (20 ml/min). Provocative maneuvers were done with the woman standing, asking her to cough three times with maximal effort, to listen to running water. Abdominal leak point pressure (ALPP) was checked, with the patient in the sitting and standing positions, at bladder volumes beginning at 150 ml and increasing in increments of 100 ml to maximum capacity, unless leakage was already seen at lower volumes. During filling, detrusor overactivity

was also noted. Finally, women were seated for a pressure-flow study that was performed in private, and the postvoid residual volume (PVR) was measured. ALPP ≤ 60 cmH_2O was accepted as intrinsic sphincter deficiency (ISD).

Statistical analysis

Descriptive data were presented as percentages, mean ± standard deviations. Normality testing (Kolmogorov-Smirnov) was performed to determine whether the data followed a Gaussian distribution or not.

Psychometric analyses of CIQ were carried out by the following procedures. The content validity was assessed by an expert panel. Reliability was evaluated by internal consistency and test-retest reliability. Internal consistency was evaluated with Cronbach's alpha. Test-retest reliability was evaluated with Spearman's correlation. Test-retest scores were also compared through the Wilcoxon signed-rank test. As there is no 'gold standard' for CI, convergent validity was assessed by correlating the scores of the PISQ-12 questionnaire by Spearman's test. Discriminant validity was evaluated by comparing the results of patients with CI (group 1) with those of patients without CI (group 2) using the Mann-Whitney U test.

Continuous variables in two independent groups were compared with the Mann-Whitney U test. The Kruskal-Wallis test was used to compare continuous variables of three or more independent groups. Categorical variables were compared by the chi-square test or Fisher's exact test. Spearman's correlation was used to assess the correlation of continuous variables. A multivariate logistic regression analysis was performed to identify factors potentially affecting the risk of CI. $p < 0.05$ was considered statistically significant.

Results

Development and validation of the CIQ

The CIQ is a self-reported questionnaire to assess the degree of the symptoms, forms of CI and effect of CI individually on the sexual function, marital relationship and quality of life. The instrument has nine questions. The questionnaire is composed of six scored items (questions 1–6) and three unscored items (question 7–9). The responses are graded on a 3–5 point Likert like scale for the first six questions. Higher scores indicate worsening of the symptoms and their impact. Items 7–9 include situations that are labeled as subitems related to coital incontinence forms, CI-related positions of sexual intercourse and preventive measures for CI, respectively. Responses to subitems are arranged as yes or no for the respondent. CI is classified based on the sum of the scores of questions 1 and 2 (minimum–maximum: 0–7) as 1–3: mild, 4–5: moderate and 6–7: severe. The CIQ is only reportable on a per-item basis.

Overall test-retest reliability coefficients were high ($r = 0.968$, $p = 0.01$), and an excellent internal consistency was demonstrated, with a Cronbach's alpha of 0.964. The test-retest scores did not show a statistically significant difference ($p = 0.158$). Convergent validity was acceptable; the CIQ correlated with PISQ-12 ($p = 0.01$, $r = 0.596$), UDI-6 ($p = 0.01$, $r = 0.435$), ICQ-SF ($p = 0.01$, $r = 0.395$) and IIQ-7 ($p = 0.01$, $r = 0.360$). Good discriminant validity was also demonstrated by highly significant mean difference scores between group 1 (4.00 ± 1.62) and group 2 (all women received a zero score from the questionnaire) ($p < 0.0001$).

Clinical and urodynamic analysis of patients

There were 414 women, with a median age of 47.6 ± 9.65 years (range 19 to 74). Of the subjects, 46.6% (193) had stress urinary incontinence (SUI), 32.9% (136) had detrusor overactivity (DO), and 20.5% (85) had mixed incontinence (MI). Of these women, 139 (33.6%) had CI (group 1), while 275 (66.4%) did not (group 2).

Clinical and urodynamic findings

Demographic and clinical details of patients are presented on Table 1. Body mass index (BMI), parity, daily incontinence episode, daily pad count and 1-h pad test results were found higher in patients with CI than in those without CI. Additionally, ICIQ-UI SF, OAB-V8, UDI-6 and IIQ-7 scores were higher in group 1 patients than group 2 patients. Urodynamic parameters except for compliance and PVR values were lower in group 1 than group 2 patients (Table 1).

History of menopause ($p = 0.411$), antidepressant use ($p = 0.490$) and hysterectomy ($p = 1.000$) rates were not different between patient groups. Moreover, CI rates were not different among age groups in patients with CI ($p = 0.796$).

According to the pad test, urinary incontinence was severe (> 50 g) in 25.0%, moderate (11–50 g) in 44.8% and mild (1–10 g) in 30.2% of patients with CI. In the non-CI group, these rates were 13.0%, 31.9% and 55.1%, respectively ($p < 0.0001$).

Symptomatic pelvic organ prolapse (POPQ stage ≥ 2) rates were 56.0% and 48.8% in group 1 and 2, respectively ($p = 0.246$). In addition, mean anterior (1.40 ± 0.80 vs. 1.39 ± 0.74), posterior (0.78 ± 1.18 vs. 0.78 ± 0.71) and apical (0.25 ± 0.62 vs. 0.18 ± 0.60) points of POPQ staging were also not different ($p = 0.737$, $p = 0.287$ and $p = 0.108$, respectively).

PISQ-12 and FSFI scores were lower in group 1 than group 2 patients ($p < 0.0001$, $p = 0.009$, respectively). Between the groups, mean desire (3.32 ± 0.84 vs. 3.53 ± 0.70), arousal (3.27 ± 0.10 vs. 3.49 ± 0.96) and satisfaction (3.60 ± 1.38 vs. 3.95 ± 1.26) domains of FSFI were statistically different ($p = 0.009$, $p = 0.036$ and $p = 0.013$, respectively), and other domains were not. Additionally, subjects with CI were less likely to initiate sexual intercourse (23.4% vs. 37.3%, $p = 0.029$).

Table 1 Demographic, clinical and some urodynamic findings of all patients with and without CI

Variables	Group 1 ($n = 139$)	Group 2 ($n = 275$)	p value*
Age (years)	48.03 ± 8.59	47.42 ± 10.20	0.685
Body mass index (kg/m^2)	31.47 ± 6.05	29.35 ± 5.24	0.008
Smoker (pack/year)	3.61 ± 13.17	5.73 ± 18.93	0.631
Charlson Comorbidity Index	0.42 ± 0.66	0.40 ± 0.65	0.850
Parity	3.21 ± 1.76	2.87 ± 1.83	0.031
ICIQ-UI SF	16.13 ± 4.36	12.14 ± 5.71	< 0.0001
OAB-V8	23.32 ± 6.56	20.24 ± 7.33	0.0003
UDI-6	10.74 ± 3.51	7.68 ± 3.28	< 0.0001
IIQ-7	11.35 ± 5.70	7.48 ± 5.43	< 0.0001
PISQ-12	16.51 ± 7.13	26.82 ± 7.24	< 0.0001
FSFI	22.75 ± 5.11	24.73 ± 5.18	0.009
Coital activity (months)	5.39 ± 4.12	5.88 ± 3.83	0.070
Incontinence episode (days)	6.03 ± 6.17	3.27 ± 4.32	< 0.0001
Pad count (days)	3.76 ± 2.78	2.23 ± 2.75	< 0.0001
Frequency (days)	11.05 ± 4.39	11.56 ± 8.00	0.699
Nocturia episodes (days)	1.41 ± 2.01	1.55 ± 1.09	0.577
Q tip test (degree)	54.09 ± 16.48	56.59 ± 15.90	0.162
Pad weight (g)	46.73 ± 71.96	28.34 ± 64.31	< 0.0001
Pelvic muscle strength (Oxford)	2.85 ± 1.31	2.86 ± 1.22	0.820
Maximum cystometric capacity (ml)	436.2 ± 112.4	480.6 ± 147.7	0.034
Compliance (ml/cmH_2O)	105.0 ± 138.0	117.5 ± 209.1	0.529
PdetQmax (cmH_2O)	26.17 ± 23.61	36.63 ± 29.89	0.0006
ALPP (cmH_2O)**	122.60 ± 40.62	138.30 ± 43.34	0.018
Bladder volume at ALPP (ml)**	233.4 ± 104.0	328.3 ± 165.9	0.0002
Urodynamic DO incontinence episode***	5.11 ± 5.77	2.31 ± 3.49	0.0007
Urodynamic DO episode***	9.78 ± 7.07	6.40 ± 5.41	0.02
Postvoid residual volume (ml)	16.44 ± 37,36	22.12 ± 46,44	0.080

Mann-Whitney U test*, patients with SUI and MI**, patients with DO***

ISD was determined as 6.3% in the group with CI and 0.9% in the group without CI ($p = 0.057$). Urodynamic voiding phase abnormality rates were not statistically different in patient groups ($p = 0.060$).

Results of multivariate analysis of these factors associated with CI are shown on Table 2. Multivariate analysis revealed daily incontinence episode, BMI, maximum cystometric capacity and PdetQmax as statistically significant factors associated with CI (Table 2).

In the CI group, SUI was 58.3%, DO 17.3% and MI 24.5%, while these rates in the non-CI group were 40.7%, 18.5% and 40.7%, respectively ($p < 0.0001$). On the other hand, CI rates in patients with SUI, DO and MI were 42.0%, 17.7% and 40.0%, respectively.

Results of the CIQ

Forms of CI in the urinary incontinence types are presented on Table 3. When CI occurred during more than one phase of sexual activity, it was defined as the combined form. None of the patients reported urinary incontinence during arousal/foreplay and masturbation alone. CI occurs in one form in 47.5% of the patients. It was seen mostly at penetration (45.3%). The combined form of CI was the most common type (54.4%). In patients with DO the penetrating form and in patients with SUI and with MI the combined CI form was seen most frequently. Rate of patients with CI only during orgasm was 2.2% in all incontinence types. CI during orgasm was seen more often in patients with DO. The rate of CI forms among the incontinence groups was not statistically different ($p = 0.265$) (Table 3).

The classification of patients with CI was as follows: mild 41.0% ($n = 57$), moderate 39.6% ($n = 55$) and severe 19.4% ($n = 27$). Increasing scores of the ICIQ-UI SF ($p = 0.005$), OAB-V8 ($p = 0.001$), UDI-6 ($p = 0.035$) and IIQ-7 ($p = 0.010$) and decreasing score of the PISQ-12 (< 0.0001) were significantly associated with increased CI severity. However, CI severity was not significantly different between the types of urinary incontinence ($p = 0.144$). In addition, severity of CI was found to be statistically different among CI forms ($p =$

Table 2 Logistic regression analysis* of variables in women with and without CI

Variables	Odds ratio	95% CI	*p* value*
Incontinence episode (day)	1.120	1.057 to 1.187	0.0001
Maximum cystometric capacity (ml)	0.998	0.996 to 0.999	0.036
PdetQmax (cmH_2O)	0.979	0.968 to 0.990	0.0001
BMI (kg/m^2)	1.067	1.019 to 1.118	0.006

0.007). As the severity of coital incontinence increased, incidences of the combined CI form also increased.

CI interfered with various levels in the sexual life in 93.5% of patients. Relationships with their partner were negatively affected in 68.3% of patients. Most patients (87.1%) with CI reported that it had a negative impact on their QoL. Most patients (88.5%) reported that they experienced various negative emotional feelings because of their urine leakage during sexual intercourse. Severity of CI was positively correlated with interference with sexual life ($r = 0.933$, $p < 0.0001$), distress in the partner relationship ($r = 0.773$, $p < 0.0001$), feeling of unhappiness ($r = 0.299$, $p = 0.001$) and feeling of negative emotions ($r = 0.436$, $p < 0.0001$).

Most patients (92.9%) declared that they had taken one or more measures such as restricting sexual activity, squeezing the pelvic floor muscles during intercourse and urinating before intercourse to avoid urine leakage during sexual intercourse. However, they reported that these measures were not always successful for prevention of CI.

Discussion

Although CI is defined as an involuntary urinary incontinence with coitus [1], urinary incontinence can also occur with non-coital sexual acts such as arousal/foreplay and masturbation [9]. Additionally, urinary incontinence during sexual activity was also defined in men after prostatectomy [24]. The term CI is inappropriate for urinary incontinence occurring during non-coital sexual acts. In this instance, we consider that it is appropriate to use the term "sexual incontinence" instead of CI [24]. We prefer the term CI when urinary incontinence occurs only during sexual intercourse.

No questionnaire specific for CI is currently available. To our knowledge, this is the first study evaluating the CI by using a specific questionnaire in women with urinary incontinence. The CIQ has been developed to determine the symptoms and impact of CI that could be used in clinical practice and research. The CIQ includes all known conditions of CI as well as non-coital sexual acts. Our validation of the CIQ demonstrates correlation with the PISQ-12, ICQ-SF, IIQ-7 and UDI-6. Since the FSFI evaluates general sexual function and contains no item related to incontinence, convergent validity was assessed with the PISQ-12. The PISQ-12 has two items related to CI. However, unlike the PISQ-12, which investigates pelvic organ prolapse, incontinence, patient and partner sexual dysfunction, the CIQ is designed only for women with CI. Overall, the CIQ showed good psychometric properties supporting its validity and reliability. The CIQ is a specific and comprehensive questionnaire that may meet the needs in this area.

The rate of CI was the highest in patients with SUI and MI in this study. In the literature, CI was reported to be significantly higher in women with SUI or MI [3, 4, 8, 12]. One study found that the CI frequency was higher in women with DO [14]. Additionally, it was found that the degree of the incontinence was more severe in patients with CI.

As the CI severity increased, the severity of urinary symptom scores increased and the quality of life scores decreased; other clinical and urodynamic parameters did not change. Additionally, the severity of CI was higher in the combined CI form. However, the severity of CI was not different concerning the types of urinary incontinence. Lau et al. also reported that the frequency of CI was not different regarding the types of incontinence [14]. There is insufficient information in the literature about CI severity and the related situations. Sexual function, relationships with partners and QoL are

Table 3 Distribution of CI forms in the different urodynamics diagnoses

Forms of Coital Incontinence	SUI *n* (%)	DO *n* (%)	Mixed *n* (%)	Total *n* (%)
Penetration	39 (61.9)	13 (20.6)	11 (17.5)	63 (100)
Orgasm	1 (33.3)	2 (66.7)	0 (0)	3 (100)
Penetration&orgasm	28 (54.9)	6 (11.8)	17 (33.3)	51 (100)
Penetration&orgasm&masturbation	8 (53.4)	2 (13.3)	5 (33.3)	15 (100)
Orgasm&masturbation	5 (71.4)	1 (14.3)	1 (14.3)	7 (100)
Total	81 (58.3)	24 (17.3)	34 (24.4)	139 (100)

negatively affected in patients with CI, especially in severe CI cases. There is more information exploring the relationship between CI and sexual life and quality of life in the literature [5–8, 14, 16, 17, 25].

In our study, the severity of urinary incontinence and ISD rate in patients with CI were found to be higher than in those without CI. It was reported that the incidence of coital incontinence was more common in patients with severe urinary incontinence [3, 7, 25, 26]. The prevalence of ISD was reported to be higher in patients with CI [10]. Differences in urodynamic DO incontinence episodes, ALPP, bladder volume at ALPP and perhaps lower maximum cystometric capacity between groups correspond to more severe SUI, MI and OAB in patients with CI. In this case, we consider that a low PdetQmax may also be related to low output resistance, which may correspond to more severe urinary incontinence rather than detrusor underactivity. Furthermore, El-Azab et al. reported that CI showed significant positive correlation with severity of SUI and significant negative correlation with ALPP [3].

It was found that the urodynamic diagnosis did not correlate with different forms of coital incontinence [8]. We also observed that the rate of CI forms among the incontinence groups was similar. The penetrative form of CI was generally reported as having higher rates in previous studies [3, 8, 9, 11–13]. In this study, severity of CI was higher in the combined form than in the others. The penetrating form in patients with DO and the combined form in patients with SUI and MI were observed most frequently. However, information concerning the combined forms of CI is scarce in the literature. Nygaard et al. showed that the combined form of CI was the second most common type [26]. Gray et al. reported that there was a significant overlap between coital incontinence forms [17]. Additionally, it may be possible that women could sometimes erroneously correlate their CI to specific moments of intercourse.

It has been suggested that the penis can trigger coital incontinence by stimulating the bladder neck and trigone [9]. A magnetic resonance imaging study of human genitals during sexual intercourse shows that the anatomical relationship of the penis and female bladder and bladder neck varies in different sexual intercourse positions [27]. Therefore, coital positions may be important for CI, too, and that is why we asked about the coital position. However, according to our findings, episodes of CI do not seem to be related to the sexual intercourse position.

In our study, a daily incontinence episode, BMI, PdetQmax and maximum cystometric capacity were important factors in the multivariate analysis. In previous studies, depression, symptomatic pelvic organ prolapse, MI, SUI, frequent urinary incontinence, frequent sexual activity [26], parity, complaints of SUI and overactive bladder, urodynamic SUI and MI [4], and maximal urethral closure pressure [14] were determined to be possible predictors of CI in multivariate analysis. However, in another study multivariate analysis did not reveal any statistically significant factor associated with CI [3].

In this study, participants were evaluated with a valid questionnaire for CI and quality of life, voiding diary and urodynamic measurements in an adequate sample size. The main weakness of this study is it did not include women without urinary incontinence. Nevertheless, other limitations of this study should be noted as follows: a depression scale (e.g., Beck), some partner-related factors (e.g., the size or shape of the penis), a neurophysiological tool for genito-pelvic reflexes and CI treatment outcomes were not investigated. Additionally, CIQ has not been validated in other languages; therefore, our results related to CIQ may not be applicable to other cultures.

The CIQ is a reliable, valid and useful tool to assess all aspects of CI in women. CI seems to be a condition related to the severity of urinary incontinence, and it negatively affects a person's quality of life. However, it is not possible to determine the exact pathophysiology of CI with our results. Further research involving genito-pelvic reflexes and women without urinary incontinence is needed to clarify the subject.

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Compliance with ethical standards

Conflicts of interest statement The authors declare that there are no financial disclosures or conflicts of interest regarding this manuscript.

Appendix I: Coital incontinence questionnaire

The questions below are specifically about with your urine leakage during sexual activity. When answering the following questions, please consider the symptoms you have experienced within the last 3 months only. Your answers will be completely confidential. There is no "right" or "wrong" answer. Please choose the answer that best corresponds to your situation. Be sure to answer all the questions.

In answering these questions, the following definitions apply:

Sexual intercourse is defined as the action or process of inserting the penis into the vagina.

Thank you very much for answering this questionnaire.

1. How much urine do you usually leak during sexual intercourse? (Please circle the number of your answer.)

None, 0

A small amount, 1

A moderate amount, 2

A large amount, 3

2. How often do you experience urinary leakage during sexual intercourse? (Please circle the number of your answer.)

Never, 0
Less than half of the time, 1
About half of the time, 2
More than half of the time, 3
All the time, 4

3. How much does your urine leakage during sexual intercourse interfere with your sexual life? (Please circle the number of your answer.)
Not at all, 0
Slightly, 1
Moderately, 2
Extremely, 3

4. How much does your urine leakage during sexual intercourse distress your relationship with your partner? (Please circle the number of your answer.)
Not at all, 0
Slightly distressed, 1
Moderately distressed, 2
Very distressed, 3

5. If you were to spend the rest of your life with your symptoms, how would you feel about that? (Please circle the number of your answer.)
Pleased, 0
Mixed feelings, 1
Unhappy, 2

6. How much do you experience the feelings such as fear, disgust, hesitation, shame or guilt because of your urine leakage during sexual intercourse? (Please circle the number of your answer.)
Not at all, 0
Slightly, 1
Moderately, 2
Extremely, 3

7. Which of the following statements describes your condition best? Please choose all the answers that apply to you.
a. I never have any urine leakage during sexual intercourse. No, 0. Yes, 1
b. I have urine leakage during intromission of my partner's penis into my vagina. No, 0. Yes, 1.
c. I have urine leakage when I have orgasm during sexual intercourse. No, 0. Yes, 1.
d. I have urine leakage when I masturbate. No, 0. Yes, 1
e. I have urine leakage during arousal/foreplay. No, 0. Yes, 1

8. Is your urinary incontinence during sexual intercourse related to the position of sexual intercourse?
a. I never have any urine leakage during sexual intercourse. No, 0. Yes, 1
b. I have urine leakage in all positions. No, 0. Yes, 1.
c. I have urine leakage when my partner lies on top. No, 0. Yes, 1.
d. I have urine leakage when I lie on top. No, 0. Yes, 1.
e. I have urine leakage when my partner lies behind my back. No, 0. Yes, 1.
f. I have urine leakage in other positions. No, 0. Yes, 1.

9. Are you taking any measures to avoid urine leakage during sexual intercourse?
a. I never have any urine leakage during sexual intercourse. No, 0. Yes, 1.
b. I have urine leakage during sexual intercourse, but I do not take any precautions. No, 0. Yes, 1.
c. I urinate before sexual intercourse. No, 0. Yes, 1.
d. I squeeze my bottom during sexual intercourse. No, 0. Yes, 1.
e. I avoid sexual intercourse. No, 0. Yes, 1.

Note: No linguistic validation was performed to obtain the English version of the CIQ presented in this publication. As such, the version cannot be considered as a validated tool and therefore cannot be used for English-speaking people.

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