



Research Article

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Are Toileting Behaviors Associated with Urinary Incontinence Symptoms? An Exploratory Study



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Abstract

Background: Toileting behaviors have been associated with urinary incontinence (UI). This study aimed to investigate the association of toileting behaviors with stress UI (SUI), urgency UI (UII) and mixed UI (MUI) in young and nulliparous women.

Material and Methods: This cross-sectional study involved 651 women aged 15 to 30 years. The International Consultation on Incontinence Questionnaire-Urinary Incontinence-Short Form was used to assess UI symptoms. Toileting behaviors included premature voiding, delayed voiding, straining during voiding, emptying the bladder completely and non-sitting posture to void. Associations were evaluated using the chi-square test, or the Mann-Whitney test. Odds ratio (OR) and respective 95% confidence intervals (CI) were computed.

Results: The prevalence of UI was 20.5% (n=123). The most common type of UI was SUI (n=76; 11.4%), followed by UII and MUI (n=28; 4.9% and n=19; 2.8%, respectively). Women who delayed voiding showed a higher risk of UII (OR = 5.31, CI: 1.22-23.03) and MUI (OR=13.65, CI: 1.72-108.2), respectively. Straining during voiding, whether "sometimes" or "many times/always" increased the risk of SUI (OR=2.50, CI: 1.50-4.17 and OR= 3.03, CI: 1.22-7.52, respectively). Additionally, adopting a non-sitting posture to void increased the risk of UII (OR=4.67, CI: 1.72-12.65).

Conclusion: Unhealthy toileting behaviors were associated with UI symptoms. Specifically, straining during voiding was associated with SUI, delayed voiding, and non-sitting posture to void with UII, and delayed voiding with MUI. Further investigations are warranted to elucidate the impact of urinary habits on the risk of developing UI symptoms.

Keywords: Healthy Female; Lower urinary tract symptoms; Micturition habits; Nulligravida; Prevalence; Risk factors

Abbreviations: BMI: body mass index; ICIQ-UI-SF: International Consultation on Incontinence Questionnaire-Urinary Incontinence-Short Form; UI: urinary incontinence; SUI: stress urinary incontinence; UII: urgency urinary incontinence; MUI: mixed urinary incontinence; LUTI: lower urinary tract infection; LUTS: Lower urinary tract symptoms

Introduction

Lower urinary tract symptoms (LUTS) describe various complaints related to urine storage, voiding, and postmicturition symptoms. Some (but not all) symptoms of all categories include urgency, incontinence, daytime frequency, nocturia, straining to void, hesitancy, terminal dribble and feeling of incomplete emptying [1]. International studies in Europe have estimated that

LUTS affects more than 60% of adults older than 40 years old [2]. In the same age group, the most bothersome symptoms were nocturia, perceived frequency, and urgency [3]. A study performed on young, healthy, and nulligravid women found that 94.3% had some kind of LUTS or urinary incontinence (UI) [4]. LUTS have a negative impact on work productivity, health-related quality of life, and social functioning in women [5].

Many women with LUTS manage symptoms with strategies that could have adverse effects, such as restricting fluid intake, which may lead to dehydration, and frequent voiding combined with a low urine output, which may reduce the bladder's functional capacity and lead to urinary tract infections [6]. Bladder health depends on internal and external factors, so it is relevant to increase knowledge to help promote healthy bladder habits. This can be achieved through primary prevention education regarding normal bladder structures and functioning and early treatment for bladder conditions.

Unhealthy toileting behaviors have been associated with LUTS [7] and an increased risk of LUTS [8]. However, these behaviors have not been consistently associated with all types of LUTS, which makes the relationship between them unclear [9]. A knowledge gap exists regarding which types of behaviors may be representative of healthy and young women. The prevalence of LUTS/UI complaints varies with age, sex, and other risk factors, but it is not known whether bladder behaviors could be related to the type of UI. The present study aimed to investigate the association of self-reported toileting behaviors with symptoms of stress urinary incontinence (SUI), urgency urinary incontinence (UUI) and mixed urinary incontinence (MUI) among young, healthy, and nulliparous women.

Materials and Methods

This is a cross sectional study conducted on a subsample of a previous original study published elsewhere [10]. Data were collected by questionnaire from athletes during sports training sessions and from the general population in educational institutions and public spaces, between November 2014 and February 2016. For the present analysis, nulliparous women aged ≥ 15 years, with body mass index (BMI) < 25 kg/m² and without chronic disease conditions were selected.

The self-report questionnaire consisted of 2 parts: part 1 included questions about age, weight, height, smoking and alcohol habits, exercise practice characteristics such as type of sport, and general medical and gynecological history. Part 2 included questions regarding daytime urinary frequency and urinary habits such as premature voiding (urinating without feeling the need to urinate), delayed voiding (waiting to empty the bladder until unable to hold the urine any longer), straining during voiding to empty the bladder faster, emptying the bladder completely and voiding posture (non-sitting posture to void). The item responses were graded using a three-point scale (1 point: never/rarely, 2 points: sometimes, 3 points: many times/always).

UI was assessed by the International Consultation on Incontinence Questionnaire-Urinary Incontinence-Short Form (ICIQ-UI-SF), a reliable and valid questionnaire to assess the prevalence, severity, and overall impact of UI on quality of life. The ICIQ-UI-SF has been translated into the Portuguese language and validated [11]. The questionnaire includes three scored items. The first item assesses the frequency of leakage (0, never to 5, all the

time), the second item assesses the amount of leakage (0, none to 6, a large amount), and the third item determines the overall impact of UI on health-related quality of life (ranging from 0, not at all, to 10, a great deal). A fourth item inquires about the patient's perception of the type of leakage. UI was operationalized to participants reporting involuntary urine loss of any type (one or more positive responses to the fourth item of the ICIQ-UI-SF). Positive responses to involuntary loss of urine associated with coughing, sneezing, physical activity, or exercise and involuntary loss of urine before reaching the toilet were classified as symptoms of SUI and UUI, respectively. Positive responses to all the above were classified as mixed urinary incontinence (MUI) [12]. The total ICIQ-UI-SF score was divided into 4 severity categories: slight (1-5), moderate (6-12), severe (13-18) and very severe (19-21) [13].

Sports were classified as high impact (characterized by jumps in which the athlete's legs temporarily leave the ground, e.g., ball games and sprints) or nonhigh impact sports (all remaining sports).

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the Ethics Committee of the Faculty of Sports of the University of Porto (CEFADE 17.2014). Informed consent was obtained from all individual participants included in the study.

Data Analysis

Participants were compared for sociodemographic, hereditary, lower urinary tract infection (LUTI), constipation, lifestyle habits, and toileting behaviors according to the presence or absence of SUI, UUI and MUI symptoms. Sports practice was categorized as no sports, nonhigh-impact sports, and high-impact sports; alcoholic beverages as < 1 beverage/week, 1-3 beverage/week, and ≥ 4 beverage/week; and urinary infections as never/rarely, and sometimes/frequently. Regarding daytime urinary frequency, participants were grouped into < 4 times/day, 4-8 times/day and > 8 times/day. Regarding toileting behaviors, three categories were considered for premature voiding, delayed voiding, straining to empty the bladder faster, emptying the bladder completely, and non-sitting posture to void: never/rarely, sometimes, and many times/always. The distribution of the variables was analyzed using the Kolmogorov Smirnov test. Comparisons between no UI and UI types were performed using the chi square test for categorical variables and the Mann-Whitney test for continuous variables. Bivariable logistic regression models were conducted to identify the toileting behaviors associated with SUI, UUI and MUI (dependent variable). Odds ratio (OR) and respective 95% confidence intervals (CI) were calculated. A different model was applied for each toileting behavior and for SUI, UUI and MUI. The results were considered statistically significant for a test value of less than 0.05 ($p < 0.05$). Statistical analysis was performed using SPSS - Statistical Package for the Social Sciences, version 25.0, IBM, 2017.

Result

Seven hundred eighty-three questionnaires were collected. After applying the selection criteria, 669 were selected. Of those, 13 exclusively reported symptoms of other types of UI [(enuresis (n=4), leaks when finished urinating and are dressed (n=5) and leaks for no obvious reason (n=4)] and therefore were not included in this study analysis. Moreover, 4 continent women and 1 woman with UUI symptoms presented incomplete data for urinary behaviors and were also excluded. Therefore, the final sample included 528 continent women and 123 women with UI aged 15 to 30 years.

SUI symptoms were the most reported type of UI. Regarding lifestyle habits, few women, both with and without UI, reported smoking habits and alcohol consumption. Almost 3/4 of participants with SUI and MUI practiced high-impact sports. Episodes of LUTI were most common among participants with UUI. A family history of UI and symptoms of constipation were reported by nearly 1/4 and 1/5 of the women, respectively. Regardless of whether they presented with UI, more than 3/4 of the women reported urinary frequency between 4-8 times/day. No women were found to be in the urinary frequency category >8 times/day (Table 1).

Table 1: Participants' background characteristics according to continence status and types of urinary incontinence symptoms (n=651).

	No UI 528 (78.5)	SUI 76 (11.4)	UUI 28 (4.9)	MUI 19 (2.8)	No UI vs. SUI	No UI vs. UUI	No UI vs. MUI
	n (%)				p		
Age (years), median (IQR)	19 (4)	19 (7)	19 (4)	18 (5)	0.075 ^a	0.881 ^a	0.752 ^a
Smoking habits (Yes) ^c	76 (14.4)	3 (3.9)	4 (14.3)	1 (5.3)	0.011 ^b	0.981 ^b	0.259 ^b
Alcoholic consumption^d							
<1 week	274 (52.0)	67 (88.2)	15 (53.6)	15 (78.9)			
1-3 week	238 (45.2)	9 (11.8)	13 (46.4)	2 (10.5)	<0.001 ^b	0.664 ^b	0.004 ^b
≥4 week	15 (2.8)	0 (0.0)	0 (0.0)	2 (10.5)			
Sport Impact^e							
No sport	215 (40.8)	7 (9.2)	15 (53.6)	2 (11.1)			
Non-high impact	168 (31.9)	16 (21.1)	2 (7.1)	2 (11.1)	<0.001 ^b	0.021 ^b	<0.001 ^b
High impact	144 (27.3)	53 (69.7)	11 (39.3)	14 (77.8)			
LUTI^e							
Never/rarely	466 (88.8)	67 (88.2)	19 (67.9)	18 (94.7)	0.877 ^b	0.001 ^b	0.414 ^b
Sometimes/frequently	59 (11.2)	9 (11.8)	9 (32.1)	1 (5.3)			
Family history of UI (yes)	148 (28.0)	23 (30.3)	9 (32.1)	3 (15.8)	0.686 ^b	0.638 ^b	0.241 ^b
Constipation (yes)	58 (11.0)	10 (13.2)	4 (14.3)	4 (21.1)	0.575 ^b	0.589 ^b	0.174 ^b
Urinary Frequency							
<4 times/day	171 (32.4)	17 (22.4)	7 (25.0)	5 (26.3)			
4-8 times/day	357 (67.6)	59 (77.6)	21 (75.0)	14 (73.7)	0.078 ^b	0.414 ^b	0.578 ^b
>8 times/day	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)			

LUTI, Lower urinary tract infection; MUI, mixed urinary incontinence; SUI, stress urinary incontinence; UUI, urgency urinary incontinence; UI, urinary incontinence; ^aMann-Whitney test; ^bChi-square test; ^cThere are 2 missing values; ^dThere is 1 missing value; ^eThere are 3 missing values; Bold, Significant at p ≤ 0.05.

Regarding UI severity, no differences were found between groups (p=0.189). The most common category was slight, with prevalence rates of 80.3%, 71.4% and 78.9% in the SUI, UUI and MUI groups, respectively.

With respect to toileting behavior habits, premature voiding was more common among UUI (sometimes and many times/always), but the difference did not reach statistical significance. Delayed voiding (sometimes and many times/always) was reported by the vast majority (>92%) of UUI and MUI women

and was significantly higher compared to women with no UI. More than half of the women reported straining to void at least sometimes (sometimes and many times/always). Differences were significant only between no UI and SUI women. More than ¾ of the total sample referred to emptying the bladder completely many times/always. No difference was found between groups. More than 80% of the women with UUI reported a non-sitting posture to void (sometimes and many times/always), and the proportion was higher than that of women with no UI (Table 2).

Table 2: Urinary behaviors according to continence status and types of urinary incontinence symptoms.

Urinary behaviors	No UI (n=528)	SUI (n=76)	UUI (n=28)	MUI (n=19)	No UI vs SUI p ^a	No UI vs UUI p ^a	No UI MUI vs p ^a
Premature Voiding							
Never/rarely	368 (69.7)	55 (72.4)	14 (50.0)	14 (73.7)	0.893	0.059	0.647
Sometimes	137 (25.9)	18 (23.7)	13 (46.4)	5 (26.3)			
Many times/always	23 (4.4)	3 (3.9)	1 (3.6)	0 (0.0)			
Delayed Voiding							
Never/rarely	146 (27.7)	17 (22.4)	2 (7.1)	1 (5.3)	0.575	0.047	0.002
Sometimes	275 (52.1)	41 (53.9)	20 (71.4)	8 (42.1)			
Many times/always	107 (20.3)	18 (23.7)	6 (21.4)	10 (52.6)			
Straining During Voiding							
Never/rarely	363 (68.8)	35 (46.1)	19 (67.9)	9 (47.4)	<0.001	0.306	0.128
Sometimes	141 (26.7)	34 (44.7)	6 (21.4)	9 (47.4)			
Many times/always	24 (4.5)	7 (9.2)	3 (10.7)	1 (5.3)			
Emptying Completely							
Many times/always	460 (87.1)	60 (78.9)	22 (78.6)	17 (89.5)	0.148	0.431	0.87
Sometimes	45 (8.5)	10 (13.2)	4 (14.3)	1 (5.3)			
Never/rarely	23 (4.4)	6 (7.9)	2 (7.1)	1 (5.3)			
Non-Sitting Posture to Void							
Never/rarely	251 (47.5)	32 (42.1)	5 (17.9)	7 (36.8)	0.512	0.004	0.158
Sometimes	215 (40.7)	32 (42.1)	20 (71.4)	7 (36.8)			
Many times/always	62 (11.7)	12 (15.8)	3 (10.7)	5 (26.3)			

^aChi square test; MUI, mixed urinary incontinence; SUI, stress urinary incontinence; UUI, urgency urinary incontinence; MUI, mixed urinary incontinence; Bold, Significant at p ≤ 0.05.

Table 3: Associations between urinary behaviors among women with stress, urgency and mixed urinary incontinence symptoms.

Urinary Behaviors	SUI (n=76)	UUI (n=28)	MUI (n=19)
	OR (95% CI)		
Delayed voiding			
Never/rarely		1	1
Sometimes		5.31* (1.22-23.03)	
Many times/always			13.65* (1.72-108.2)
Straining during voiding			
Never/rarely	1		
Sometimes	2.50* (1.50-4.17)		
Many times/always	3.03* (1.22-7.52)		
Non-sitting posture to void			
Never/rarely		1	
Sometimes		4.67* (1.72-12.65)	
Many times/always			

CI: confidence interval; OR: odds ratio; SUI: stress urinary incontinence; UUI: urgency urinary incontinence; MUI: mixed urinary incontinence; *p<0.05.

Associations between urinary behaviors among women with SUI, UUI, and MUI symptoms are shown in Table 3. Delayed voiding was associated to higher odds of presenting UUI and MUI symptoms; straining during voiding increased the odds of presenting SUI symptoms and non-sitting posture to void increased the odds of presenting UUI symptoms.

Discussion

The present study, performed in a sample of nulliparous adult women with no comorbidities, found that, compared with continent women, a higher proportion of women with UUI symptoms reported delayed voiding and adopted a non-sitting posture to void. Additionally, straining during voiding to empty the bladder faster was more common in women with SUI symptoms.

Toileting behaviors have been a common topic of research in the field of pelvic floor dysfunction, more specifically about UI [14], and several studies have been conducted in different samples, such as employed women in an academic medical center [15], nurses [8] and young women (aged 18 to 26 years old) [16,17]. Based on a proposed theoretical framework, not only individual but also social and environmental factors could be involved [18]. However, it is not known whether toileting behavior could be a cause or an effect since all the performed studies have a cross-sectional design. Considering a previous research study, toileting behaviors were not consistently associated with all types of LUTS [9]. Premature voiding, delayed voiding, and straining to void were associated with UI, OAB, and urinary frequency. Delayed voiding was also associated with the symptom of urinary urgency. Place preference for voiding was associated with UI and urinary frequency, and position preference for voiding was associated with UI [9]. Some of our results are in line with those findings.

Risk factors for UI have been extensively studied in the last 30 years. The major risk factors for UI are age, BMI, menopause, recurrent LUTI, obstetric factors, and comorbidities such as diabetes and chronic pulmonary disease [19]. Since the sample of the present study included young and healthy adult women, nulliparous and with normal BMI, those risk factors are not present, except for recurrent LUTI (no differences between women with and without UI).

Regarding lifestyle characteristics, differences between continent and incontinent women were found in smoking habits, alcoholic beverage consumption, and type of sport practiced. Although a higher proportion of incontinent women reported smoking habits and alcoholic beverage consumption, the prevalence rates were low, and the amount of cigarette and alcohol consumption was not considered. Considering the type of sport practiced, a higher proportion of incontinent women were involved in high-impact sports, which has been identified as a risk factor for UI [20].

Almost 3/4 of the total sample reported a daily urinary frequency between 4 and 8. Interestingly, no participants reported

a daytime frequency higher than 8, although nearly 1/3 of incontinent women presented symptoms of UUI. A range between 4 and 8 has been referred to as normal daily urinary frequency in the absence of kidney pathology [21]. However, the amount of daily fluid intake is a factor to be considered, and this information was not collected from this sample. Moreover, according to the International Continence Society, there is no established threshold to consider normal daytime frequency, and increased daytime frequency is defined as "the complaint by the patient who considers that he/she voids too often by day" [22].

Toileting Behaviors and SUI

In the present study, of the different urinary habits considered, only straining was associated with SUI. More than half of the women reported at least sometimes straining during voiding to empty the bladder faster, a higher proportion than reported in another research study (32%) [14]. Other studies found that women with bladder problems were more likely to use straining behaviors to empty the bladder faster [8,15-17,23,24]. Abdominal straining is considered pathological [25] and a compensatory mechanism for weaker detrusor contraction in incontinent women [26]. Excess loading caused by "pushing down" can lead to a decrease in anatomical support for the bladder neck and urethra. Some researchers recommend that women learn to relax the pelvic floor and avoid straining as the optimal way to empty their bladder [16]. However, straining may be a habit women use to increase the urine stream and shorten the flow time. There are several reasons that may lead to this habit in adult women, and they may be related, among others, to having little time for breaks at work [27]. Since in the present study abdominal straining was evaluated by questionnaire, it is not possible to quantify how much effort was usually adopted by the different women and the resultant increase in intra-abdominal pressure. In the present study women reporting straining during voiding were 3 times more likely to present SUI symptoms.

Toileting Behaviors and UUI

Delayed voiding was a common behavior in the total sample of the present study, as reported in other studies [7,8,16,24], and was more prevalent among women with UUI symptoms. The association of delayed voiding with LUTS was reported previously [8,15,17,23,24]. Delayed voiding is considered an unhealthy habit, leading to chronic excessive tension of the detrusor smooth muscle, which gradually results in detrusor overactivity, underactivity or hyperactivity, impaired contractility, and low compliance of the bladder [28]. Delayed voiding can be a habit but can also depend on different factors, such as toilet access, finding clean toilets, privacy, or work-related factors [27].

Non-sitting posture to void was also associated with UUI. Almost 80% of UUI women referred non-sitting on the toilet seat to void at least sometimes (sometimes and many times/always). This toileting behavior seems to be common in our sample since

approximately half of the women with no UI, SUI, or MUI also reported adopting this posture to void. Only a significant difference was obtained between continent and UUI women. Contrary to our findings, sitting to urinate has been reported to be adopted by the majority of women (working women) [23] and was not associated with UUI [15]. In Western countries, a sitting position is the typical position to empty the bladder, and it is adopted by most women of all ages at home [7,16,24], although other positions, such as crouching/hovering over the toilet and semi squatting, are used when away from home [24]. Authors suggested that avoiding sitting on the toilet seat does not allow the pelvic floor to relax and may result in poor bladder emptying with increased residual urine volume [29], although conflicting results have also been reported [30]. Moreover, it was also found that in a sitting posture, women were more prone to exhibit normal urine flow [30,31]. Differences found between studies can be explained by age. Healthy toileting behaviors include a relaxed position for urination, relaxation of the pelvic floor, and allowing adequate time for the bladder to empty [6]. However, if a non-sitting posture to void is a regular behavior, there may be no influence on achieving PFM relaxation during urination. In the present study, delayed voiding or non-sitting posture to void increased 5 times the odds of presenting UUI symptoms.

Toileting Behaviors and MUI

Of all the urinary habits considered, only delayed voiding was associated with MUI symptoms, increasing almost 14 times the odds of MUI symptoms. The same association was found in the UUI group. Since MUI symptoms include both SUI and UUI, it is no surprise that this association occurs. However, the low sample size found in this category impacts the results of the statistical analysis, and therefore, no considerations will be made.

Regarding the remaining habits that were not associated with any of the UI groups, Premature voiding was not a common habit in the total sample of the present study, although a higher proportion was found in UUI women. Controversies were found in the scientific literature, where this behavior was both highly [14,23] and weakly [7,15] reported in previous studies on incontinent women. In a sample of nulliparous women, it was highly common (71%) and associated with UI. However, this association was not confirmed by a logistic regression analysis considering confounding factors [14]. Premature voiding may be related to avoiding using public toilets because of poor cleanliness [24] or other personal reasons. Whether this was an environmental factor, or a habit could not be determined in this sample.

The conscious emptying of the bladder was reported in the present study by most of the women. This result agrees with a finding in a sample of working women [15] but is more common than in another sample of young women (18 to 26 years) [17]. No differences were found between continent and women with both SUI and UUI symptoms. Postmicturition symptoms have received less attention than storage and voiding symptoms.

Popular symptom assessment tools described the feeling of incomplete bladder emptying as "a self-explanatory term for a feeling experienced by the individual after passing urine" [22]. The score for a feeling of incomplete emptying by the Overactive Bladder Symptom Score was not correlated with any other LUTS in women and was negatively correlated with the amount of Post Void Residual (PVR) when PVR was <50ml, suggesting that this self-identified feeling could occur independently despite little actual PVR volume [32]. The mechanism responsible for the sense of residual has not been clarified. Some authors described possible explanations; detrusor overactivity because of increased afferent activity could be responsible for a residual sense of urine, and on the other hand, some specific neurotransmitters that are emitted during detrusor contraction and their receptors may be responsible for such a feeling [32].

Study limitations

The questions to assess urinary habits were elaborated based on studies of the same theme since there was no validated questionnaire for the population considered. However, the questions were translated and applied in advance to a group of individuals with the same characteristics to assess their clarity and interpretation. As the number of women with the different types of UI was low, it was not possible to control for potential confounders. However, based on evidence, we considered confounders a priori, and only young, nulliparous women with no comorbidities and with normal BMI were included in the analysis. The regression models presented here were not adjusted for other characteristics known to be associated to incontinence. However, such confounding control was done in what concerns age, parity and BMI, since only young, nulliparous and non-obese women were included in the present study sample. Regarding sports practice, it was not possible to consider it in the analysis due to the diversity of modalities and the low number of participants in some categories.

Conclusion

In healthy and young adult women, some urinary habits were associated with UI symptoms. Straining during voiding with SUI, delayed voiding and non-sitting posture to void with UUI, and delayed voiding with MUI. UI is not a static condition, and the progression, delay, or remission can depend on multiple factors, some of which are modifiable factors. Toileting behaviors may vary considerably over time, even fluctuating on successive days, and external factors could modulate these behaviors. In the present study, each urinary behavior was analyzed individually in relation to continence status and for each UI subtype, and it was not possible to determine the potential cumulative effect of regularly adopting more than one unhealthy habit. Therefore, more research is needed to clarify the impact they may have on UI and thus incorporate this information into educational actions from an early age.

Competing Interest

The authors declare that they have no competing interests.

Author's Contribution

AC contributed to project development, data Collection and manuscript writing/editing. RG contributed to data analysis and manuscript writing. RNJ contributed to project development. MF contributed to project development and manuscript writing. All authors read and approved the final manuscript.

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