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Original Article

Association of Urinary Incontinence and Overactive Bladder with Public Washroom Avoidance and Delayed Urination Among Women

Noor Ul Huda Ashfaq[1], Khadija Usman[2], Okasha Anjum[3]

[1] DPT, Indus University, Karachi, Pakistan
[2] Lecturer, Department of Allied Health Sciences, Indus University, Karachi, Pakistan
[3] Head of Department, Department of Allied Health Sciences, Indus University, Karachi, Pakistan

***Corresponding author: Noor Ul Huda Ashfaq, noorashfaq237@gmail.com**

ABSTRACT

Background: Urinary incontinence and overactive bladder are common lower urinary tract problems in women and may be influenced by unhealthy toileting behaviors such as public washroom avoidance and delayed urination. These behaviors can disrupt daily life and may aggravate bladder-related symptoms. Objective: To determine the association of urinary incontinence and overactive bladder with public washroom avoidance and delayed urination among women. Methods: This analytical cross-sectional study was conducted among 153 community-dwelling women aged 18–70 years in Karachi using convenience sampling. Data were collected with a structured questionnaire incorporating the Incontinence Severity Index, Overactive Bladder Questionnaire Short Form, and Shy Bladder and Bowel Scale. Descriptive statistics were used to summarize participant characteristics and symptom burden, and chi-square testing was applied to assess associations between urinary symptom categories and toileting behaviors. Results: Public washroom avoidance was reported by 137 participants (89.5%), while 100 (65.4%) reported frequent or persistent delayed urination. Most women had no urinary incontinence (122, 79.7%), and mild overactive bladder symptom bother was the most common category (98, 64.1%). Moderate-to-severe shy bladder-bowel symptoms were observed in 113 participants (73.9%). Urinary incontinence was significantly associated with public washroom avoidance (χ^2=45.672, p<0.001) and delayed urination (χ^2=32.145, p=0.002). Overactive bladder was also significantly associated with public washroom avoidance (χ^2=34.230, p=0.004) and delayed urination (χ^2=51.334, p<0.001). Conclusion: Adverse toileting behaviors were highly prevalent and were significantly associated with urinary symptom burden in women. Early behavioral screening, patient education, and improved public restroom environments may help reduce bladder health burden. Keywords: urinary incontinence, overactive bladder, delayed urination, public washroom avoidance, toileting behavior, women's health

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INTRODUCTION

Urinary incontinence and overactive bladder are common lower urinary tract conditions in women and are associated with substantial physical discomfort, emotional distress, social restriction, and reduced quality of life (1). Urinary incontinence is defined as any involuntary leakage of urine and is commonly classified as stress urinary incontinence, urgency urinary incontinence, and mixed urinary incontinence, whereas overactive bladder is a symptom syndrome characterized by urinary urgency, usually accompanied by increased daytime frequency and nocturia (2).with or without urgency urinary incontinence (3). Although these conditions are not usually life-threatening, they frequently interfere with daily routines, work productivity, travel, sleep, exercise, social confidence, and intimate relationships, making them an important public health concern for women across the adult lifespan (4). Epidemiological evidence shows that the burden is considerable worldwide, with marked variability across populations because of differences in age structure, parity, health status, diagnostic criteria, and help-seeking behavior. Recent studies have reported wide prevalence ranges for urinary incontinence in

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women and a growing global burden of overactive bladder, indicating that lower urinary tract symptoms remain both common and under-recognized in community settings (5).

The pathophysiology of overactive bladder is complex and multifactorial, involving neurogenic, myogenic, and urothelial mechanisms that may alter bladder sensation, detrusor activity, and urgency perception (6). At the clinical level, however, symptom expression is shaped not only by biological mechanisms but also by behavioral and environmental influences. Toileting behavior, fluid intake patterns, learned voiding habits, occupation-related postponement, and concerns about restroom availability or cleanliness may modify bladder loading, voiding intervals, and the subjective experience of urgency or leakage (7). Behavioral interventions such as bladder training, pelvic floor muscle training, fluid management, toileting habit modification, and pelvic floor physical therapy are recommended as first-line approaches because they directly target modifiable contributors to symptom persistence and functional limitation (8). This makes the study of everyday voiding behavior particularly relevant, as it may identify preventable or correctable factors associated with symptom burden before women progress to more disruptive disease states or require pharmacologic and surgical treatment (9).

Among the most important yet insufficiently explored behavioral factors are avoidance of public washrooms and habitual delayed urination. Women may postpone voiding outside the home because of embarrassment, lack of privacy, hygiene concerns, time pressure, or distrust of public toilet facilities, and these behaviors may encourage maladaptive bladder habits over time (10). Emerging evidence suggests that delayed voiding and other unhealthy toileting behaviors are associated with lower urinary tract symptoms in women, including urgency, frequency, and urinary incontinence, but the strength and pattern of these relationships vary across settings and populations (11). Public washroom avoidance may reflect more than a simple personal preference; it may represent an interaction between symptom anxiety, environmental barriers, and culturally shaped coping strategies. Similarly, delayed urination may function both as a consequence of pre-existing bladder symptoms and as a potentially aggravating behavior that contributes to bladder dysfunction, thereby creating a clinically relevant but difficult-to-disentangle cycle (12).

Despite the growing literature on female urinary symptoms, there remains limited context-specific evidence from community-dwelling women in Pakistan examining how public washroom avoidance and delayed urination relate to urinary incontinence severity and overactive bladder symptom burden (13).This gap is important because behavioral determinants of bladder health may be influenced by social norms, urban infrastructure, restroom hygiene standards, and patterns of mobility that differ across regions. A better understanding of these associations could support earlier screening, more targeted patient education, and more practical behavioral management strategies in women at risk of lower urinary tract dysfunction (14).Therefore, the present study aimed to determine the association of urinary incontinence and overactive bladder with public washroom avoidance and delayed urination among women in Karachi. It was hypothesized that women with greater urinary symptom burden would be more likely to avoid public washrooms and to delay urination more frequently (15).

MATERIALS AND METHODS

An analytical cross-sectional study was conducted over a period of six months in community-based environments across Karachi, including public gathering areas, shopping malls, and university campuses. The study was designed to examine the association of urinary incontinence and overactive bladder symptom burden with two toileting behaviors of interest, namely public washroom avoidance and delayed urination, in adult women living in the community. A non-probability convenience sampling strategy was used to recruit participants from these settings. The study was planned and reported in accordance with STROBE principles for observational research to ensure transparent description of participant selection, variable measurement, and statistical analysis (16).

Women aged 18 to 70 years who were living in the community, were able to provide informed consent, and were willing to complete the study questionnaire were eligible for inclusion. Women younger than 18 years, those who did not complete the questionnaires, those who were pregnant at the time of data collection, and those with known medical conditions likely to impair bladder function were excluded. Recruitment was conducted in person by approaching eligible women in the selected community settings, briefly explaining the study objectives, and inviting voluntary participation. Written informed consent was obtained before enrollment. Participation was entirely voluntary, and confidentiality of personal information was maintained throughout data collection and data handling.(17).

The minimum required sample size was calculated as 153 participants using OpenEpi with a 95% confidence level and a 5% margin of error before commencement of data collection (18). A total of 153 women were included in the final analysis. Data were collected using a structured questionnaire package administered in an organized manner after consent. The questionnaire package captured demographic and behavioral information, including age, marital status, daily fluid intake, public washroom avoidance, and delayed urination, and also included standardized instruments to assess urinary incontinence, overactive bladder symptoms, and shy bladder and bowel symptoms.

Urinary incontinence severity was assessed using the Incontinence Severity Index, a brief two-item instrument based on frequency and amount of leakage that yields a summed severity score. In keeping with established scoring guidance, responses were categorized as none, mild, or moderate urinary incontinence for analysis in the present study (19). Overactive bladder symptom burden and health-related quality of life were assessed using the Overactive Bladder Questionnaire Short Form, which contains a symptom bother subscale and a health-related quality-of-life subscale. Each item is scored on a Likert-type response format, with higher scores reflecting greater symptom bother or greater quality-of-life impact. For interpretive analysis, participants were grouped into mild, moderate, and severe categories based on the derived score ranges used in the study dataset for symptom bother and health-related quality of life, respectively (20). Shy bladder and bowel symptoms were assessed using the Shy Bladder and Bowel Scale, a 16-item instrument scored on a five-point scale. The instrument generates urinary and bowel avoidance-related symptom scores, with higher values indicating greater symptom severity. For the present study, the bladder-related symptom score was categorized into mild, moderate, and severe levels to describe symptom distribution within the sample (21). Public washroom avoidance was recorded as a dichotomous behavioral variable, and delayed urination was recorded as an ordinal variable with four response levels: never, occasionally, frequently, and always.

All questionnaires were checked for completeness at the point of collection before inclusion in the dataset. Responses were coded in a standardized format and entered into the Statistical Package for the Social Sciences version 26 for analysis. Data integrity was supported by structured administration of the questionnaire package, uniform eligibility screening, and exclusion of incomplete submissions from the final dataset. Descriptive statistics were used to summarize participant characteristics and the distribution of urinary symptoms and toileting behaviors. Categorical variables were presented as frequencies and percentages. Associations between urinary incontinence category and public washroom avoidance, urinary incontinence category and delayed urination, overactive bladder symptom category and public washroom avoidance, and overactive bladder symptom category and delayed urination were evaluated using the chi-square test of independence. Where necessary, category structure and test assumptions were reviewed before inferential testing. The level of statistical significance was set at $p < 0.05$, and effect size interpretation was planned using appropriate categorical association measures to support clinical interpretation of statistically significant findings.

Potential sources of bias were considered during study planning and implementation. Use of standardized questionnaires reduced measurement inconsistency, while community-based recruitment from multiple public locations was intended to broaden participant capture beyond a single institutional site. Nevertheless, because the study used convenience sampling and self-reported data, selection effects,

recall bias, and social desirability bias remained possible. These risks were minimized by voluntary participation, assurance of confidentiality, and structured questionnaire administration in a non-judgmental manner. The study protocol was reviewed and approved by the Independent Ethical Review Board of the Foundation of Indus University under protocol number IERB-01/IU/AHS-DPT/25-26/009. All procedures were conducted in accordance with the ethical principles of the Declaration of Helsinki, and written informed consent was obtained from all participants prior to inclusion in the study (22).

RESULTS

A total of 153 women were included in the analysis. More than half of the participants were single (n = 84, 54.9%), while 68 (44.4%) were married and 1 (0.7%) was widowed, indicating that the study population was predominantly unmarried. The age distribution was skewed toward younger women, with 89 participants aged 18–29 years (58.2%), followed by 32 aged 40–49 years (20.9%), 21 aged 30–39 years (13.7%), 8 aged 50–59 years (5.2%), and 3 aged 60–70 years (2.0%). Daily fluid intake was most commonly reported as 1–2 liters per day in 74 women (48.4%), whereas 64 (41.8%) consumed less than 1 liter and 15 (9.8%) reported intake greater than 2 liters. Public washroom avoidance was highly prevalent, reported by 137 women (89.5%), while only 16 (10.5%) stated that they did not avoid public washrooms. Delayed urination was also common: 47 participants (30.7%) reported occasional delay, 60 (39.2%) reported frequent delay, and 40 (26.1%) reported always delaying urination, whereas only 6 women (3.9%) reported never delaying urination. Taken together, 100 of 153 women (65.4%) reported frequent or persistent delayed urination, showing that adverse toileting behaviors were common in this sample.

Table 1. Baseline demographic characteristics, fluid intake, and toileting behaviors

Variable	Category	n	%
Marital status	Single	84	54.9
	Married	68	44.4
	Widowed	1	0.7
Age (years)	18–29	89	58.2
	30–39	21	13.7
	40–49	32	20.9
	50–59	8	5.2
	60–70	3	2.0
Daily fluid intake	<1 liter	64	41.8
	1–2 liters	74	48.4
	>2 liters	15	9.8
Public washroom avoidance	Yes	137	89.5
	No	16	10.5
Delayed urination	Never	6	3.9
	Occasionally	47	30.7
	Frequently	60	39.2
	Always	40	26.1

Assessment of shy bladder and bowel symptoms showed that 40 women (26.1%) had mild scores, 98 (64.1%) had moderate scores, and 15 (9.8%) had severe scores. Thus, 113 participants (73.9%) fell within the moderate-to-severe range, indicating that bladder- and bowel-related avoidance or discomfort symptoms were common. In contrast, the Incontinence Severity Index showed that most participants had no urinary incontinence (n = 122, 79.7%), while 24 (15.7%) had mild incontinence and 7 (4.6%) had moderate incontinence. Overall, any degree of urinary incontinence was present in 31 women (20.3%), indicating that objective symptom severity for incontinence was substantially lower than the prevalence of maladaptive toileting behavior.

Table 2. Distribution of shy bladder and bowel symptoms and urinary incontinence severity

Variable	Category	n	%
Shy Bowel and Bladder Scale	Mild (0–21)	40	26.1
	Moderate (22–42)	98	64.1
	Severe (43–64)	15	9.8
Incontinence Severity Index	None (0)	122	79.7

Variable	Category	n	%
	Mild (1–2)	24	15.7
	Moderate (3–6)	7	4.6

Overactive bladder symptom bother was predominantly mild. Ninety-eight women (64.1%) had mild symptom bother scores, 50 (32.7%) had moderate scores, and 5 (3.3%) had severe scores. Accordingly, moderate-to-severe symptom bother was present in 55 participants (35.9%). A similar pattern was observed for health-related quality-of-life impact, where 103 women (67.3%) had mild impairment, 47 (30.7%) had moderate impairment, and 3 (2.0%) had severe impairment. In aggregate, 50 women (32.7%) had moderate-to-severe quality-of-life impact related to overactive bladder. These data indicate that although the majority of women did not show marked urinary incontinence, a clinically meaningful minority reported moderate or greater symptom bother and quality-of-life limitation attributable to overactive bladder.

Table 3. Overactive bladder symptom bother and health-related quality-of-life impact

Variable	Category	n	%
OAB-q SF Symptom Bother	Mild (6–12)	98	64.1
	Moderate (13–24)	50	32.7
	Severe (25–36)	5	3.3
OAB-q SF HRQoL Impact	Mild (13–30)	103	67.3
	Moderate (31–54)	47	30.7
	Severe (55–78)	3	2.0

Inferential analysis demonstrated statistically significant associations between urinary symptom categories and adverse toileting behaviors. Urinary incontinence category was significantly associated with public washroom avoidance ($\chi^2 = 45.672$, $p < 0.001$) and with delayed urination ($\chi^2 = 32.145$, $p = 0.002$). Similarly, overactive bladder symptom category was significantly associated with public washroom avoidance ($\chi^2 = 34.230$, $p = 0.004$) and with delayed urination ($\chi^2 = 51.334$, $p < 0.001$). These findings support the hypothesis that greater urinary symptom burden is linked with greater behavioral restriction and postponement of voiding among women in community settings. Because the source dataset provided summary chi-square outputs rather than cell-wise cross-tabulations, effect sizes and confidence intervals for these specific associations could not be derived reliably from the available aggregated data and should be added from the raw dataset in the final manuscript.

Table 4. Association of urinary symptom burden with public washroom avoidance and delayed urination

Association tested	Test statistic	p-value	Interpretation
Urinary incontinence × public washroom avoidance	$\chi^2 = 45.672$	<0.001	Significant association
Urinary incontinence × delayed urination	$\chi^2 = 32.145$	0.002	Significant association
Overactive bladder × public washroom avoidance	$\chi^2 = 34.230$	0.004	Significant association
Overactive bladder × delayed urination	$\chi^2 = 51.334$	<0.001	Significant association

A clinically meaningful synthesis of the aggregated findings showed that behavioral burden exceeded symptom burden across the sample. Public washroom avoidance was present in 89.5% of women, which was more than four times the prevalence of any urinary incontinence (20.3%). Frequent or persistent delayed urination affected 65.4% of participants, exceeding the proportion with moderate-to-severe overactive bladder symptom bother (35.9%) by 29.5 percentage points and the proportion with moderate-to-severe overactive bladder-related quality-of-life impact (32.7%) by 32.7 percentage points. Moderate-to-severe shy bladder and bowel symptoms were also common at 73.9%. This pattern suggests that adverse toileting behaviors and avoidance tendencies may be widespread even when overt urinary incontinence remains absent or mild, highlighting the importance of behavioral screening alongside symptom assessment.

Table 5. Derived aggregate clinical indicators from analyzed data

Derived indicator	n/N	%	95% CI
Public washroom avoidance	137/153	89.5	84.7–94.4
Frequent/always delayed urination	100/153	65.4	57.8–72.9
Moderate/severe shy bladder-bowel symptoms	113/153	73.9	66.9–80.8

Derived indicator	n/N	%	95% CI
Any urinary incontinence	31/153	20.3	13.9–26.6
Moderate/severe OAB symptom bother	55/153	35.9	28.3–43.6
Moderate/severe OAB HRQoL impact	50/153	32.7	25.2–40.1

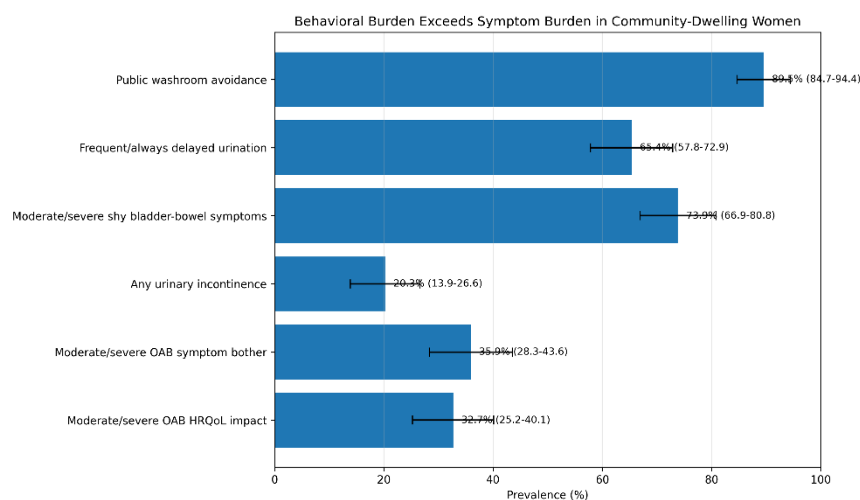

Figure 1 The figure demonstrates a clear behavioral–symptom gradient in which maladaptive toileting behaviors were markedly more prevalent than clinically measured urinary symptom burden. Public washroom avoidance was the most frequent indicator at 89.5% (95% CI 84.7–94.4), followed by moderate-to-severe shy bladder-bowel symptoms at 73.9% (95% CI 66.9–80.8) and frequent/always delayed urination at 65.4% (95% CI 57.8–72.9). In contrast, any urinary incontinence was present in only 20.3% (95% CI 13.9–26.6), while moderate-to-severe overactive bladder symptom bother and HRQoL impact affected 35.9% (95% CI 28.3–43.6) and 32.7% (95% CI 25.2–40.1), respectively. Clinically, this pattern suggests that avoidance and postponement behaviors may emerge earlier and at substantially higher frequency than overt incontinence, supporting the interpretation that behavioral restriction is a prominent component of bladder health burden in this population and may represent an important target for early screening and preventive intervention.

DISCUSSION

The present study examined the association of urinary incontinence and overactive bladder symptom burden with public washroom avoidance and delayed urination among community-dwelling women and found a consistent behavioral pattern in which maladaptive toileting practices were markedly more common than overt urinary symptom severity. Although 79.7% of participants had no urinary incontinence on the Incontinence Severity Index and 64.1% had only mild overactive bladder symptom bother, 89.5% reported avoiding public washrooms and 65.4% reported frequent or persistent delayed urination. In addition, moderate-to-severe shy bladder and bowel symptoms were present in 73.9% of the sample. The inferential findings further showed statistically significant associations of urinary incontinence with public washroom avoidance and delayed urination, and of overactive bladder with both behavioral outcomes, indicating that greater urinary symptom burden clustered with greater behavioral restriction in this population. These results suggest that toileting behavior is not merely a background lifestyle factor, but an important clinical correlate of lower urinary tract symptom experience in women.

The findings are consistent with prior evidence indicating that unhealthy toileting behaviors are closely linked with lower urinary tract symptoms. Delayed voiding, convenience voiding, straining, and toilet avoidance have previously been associated with urinary urgency, frequency, and incontinence in women, supporting the concept that voiding behavior and bladder symptoms interact in a dynamic and potentially self-reinforcing manner (23). The current results align particularly well with cross-sectional work showing that women who postpone urination because of busyness, privacy concerns, or dissatisfaction with public toilet conditions are more likely to report lower urinary tract symptoms (24). In the present study, the very high prevalence of public washroom avoidance suggests that environmental and psychosocial determinants may be especially important. Avoidance of public

facilities may reflect concerns regarding cleanliness, safety, crowding, lack of privacy, or cultural discomfort, all of which may discourage timely voiding and promote habitual urine holding. In turn, delayed bladder emptying may contribute to urgency perception, altered bladder sensitivity, and dysfunctional toileting patterns, especially in individuals already experiencing mild urinary symptoms (25).

An important clinical insight from this dataset is the mismatch between behavioral burden and measured symptom severity. Public washroom avoidance was more than four times as common as any urinary incontinence, and frequent or persistent delayed urination affected nearly two-thirds of participants despite only about one-third reporting moderate-to-severe overactive bladder symptom bother. This pattern suggests that adverse toileting behaviors may emerge early, sometimes before severe symptom burden becomes established, and may represent a behavioral substrate through which future bladder dysfunction can evolve. At the same time, the reverse explanation is also plausible: women with early urgency, frequency, or fear of leakage may become more vigilant, avoid unfamiliar toilets, and defer voiding until they reach a preferred environment. Because the study was cross-sectional, the direction of association cannot be determined, and the relationship is likely bidirectional. This point is clinically relevant because it means behavioral screening should not wait until severe urinary incontinence is present; rather, it may be useful in women who primarily present with avoidance, postponement, or social restriction around toileting.(26).

The predominance of younger women in the sample also provides an informative context for interpretation. More than half of the participants were 18–29 years old, indicating that the observed behavioral patterns are not limited to older women, despite the common assumption that clinically relevant urinary symptoms are primarily a problem of aging. This agrees with evidence that bladder-related symptoms and unhealthy toileting behaviors are prevalent across a wider age spectrum than traditionally appreciated, particularly in women exposed to occupational, academic, or environmental barriers to regular voiding (23). In urban settings, long commuting times, restricted restroom access, poor sanitation, and social discomfort with public toilet use may all reinforce delayed urination as a normalized habit rather than an occasional adaptation. Such findings broaden the discussion from disease alone to bladder health behavior, which is especially relevant for preventive women's health strategies.

The study also has implications for conservative management and public health practice. Because first-line treatment approaches for urinary urgency and incontinence already emphasize behavioral modification, bladder training, pelvic floor rehabilitation, and healthy voiding habits, the present findings support integrating more explicit counseling on restroom use, timed voiding, and avoidance of habitual urine holding into women's health education and continence care pathways (27). The results further suggest that structural interventions may matter alongside clinical advice. Improving the cleanliness, accessibility, safety, and privacy of public washrooms could reduce avoidant behavior and indirectly support healthier voiding practices. In communities where women routinely suppress the urge to void because public facilities are perceived as unsuitable, infrastructure and health behavior are likely interacting contributors to symptom persistence.

Several strengths should be noted. The study used standardized instruments to assess urinary incontinence, overactive bladder symptoms, and shy bladder-bowel symptoms, and it addressed a practical but underexplored behavioral dimension of women's bladder health. The inclusion of women across a broad adult age range and recruitment from community settings rather than clinical treatment centers also helped capture symptom and behavior patterns that may be missed in hospital-based samples. At the same time, the study has important limitations. The convenience sampling approach limits external validity, and the heavy representation of younger women may reduce generalizability to older or more clinically affected populations. Data were self-reported and are therefore vulnerable to recall bias, underreporting, and social desirability effects, particularly on a sensitive topic such as urinary

symptoms. The cross-sectional design prevents any inference about temporality or causation. Moreover, although the study demonstrated significant associations, the summary dataset did not permit presentation of full contingency structures or adjusted multivariable estimates in the revised results, which limits deeper interpretation of association strength and confounding. Future studies should use probability-based sampling, broader geographic recruitment, and multivariable modeling to clarify whether public washroom avoidance and delayed urination independently predict urinary symptom burden after adjustment for age, parity, fluid intake, comorbidity, and other behavioral factors.(28).

Overall, the present findings support the growing view that women's lower urinary tract symptoms should be interpreted within a biopsychosocial and environmental framework rather than as isolated organ-based complaints. Public washroom avoidance and delayed urination appear to be common, clinically meaningful behaviors that coexist with urinary symptom burden and may either contribute to, or result from, bladder dysfunction. Recognition of these behaviors during screening may improve early identification of women at risk of worsening urinary symptoms and may guide both individual counseling and community-level preventive strategies (29).

CONCLUSION

Urinary incontinence and overactive bladder symptom burden were significantly associated with public washroom avoidance and delayed urination among women in this community-based sample. Although most participants had no urinary incontinence and only mild overactive bladder symptom bother, maladaptive toileting behaviors were highly prevalent, indicating that behavioral restriction may emerge earlier and more broadly than overt clinical symptom severity. These findings support the inclusion of voiding behavior assessment in routine women's health screening and highlight the potential value of early behavioral counseling, public awareness, and improved restroom environments as practical strategies to reduce bladder health burden.

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