

The prevalence of chronic constipation and faecal incontinence among men and women with symptoms of overactive bladder

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OBJECTIVE

To estimate the prevalence and overlap of overactive bladder (OAB), chronic constipation (CC) and faecal incontinence (FI) among a general population sample of adults in the USA.

PATIENTS AND METHODS

A cross-sectional internet-based survey of randomly selected panel members who were ≥40 years of age was conducted. Participants reported how often they experienced symptoms of OAB, CC and FI using Likert scales and modified Rome III criteria. Analyses were conducted to examine the overall prevalence of OAB, CC and FI in men and women separately and to characterize the extent of overlap between these conditions in participants with OAB vs those without OAB, and those participants with continent vs incontinent OAB.

RESULTS

The response rate for the survey was 62.2% and the final sample ($N = 2000$) included

What's known on the subject? and What does the study add?

There have been no previous studies examining the overlap of chronic constipation and overactive bladder in the US population. Limited research to date based on samples of elderly, Asian and pediatric populations suggests that there is substantial overlap. The results of this study suggest that the prevalence of chronic constipation is increased in people with overactive bladder who are ≥40 years and should be considered by healthcare providers treating these patients.

927 men and 1073 women. The overall prevalence of OAB [defined as a response of ≥ 'sometimes' to urinary urgency (i.e. 'sometimes' or more often) or 'yes' to urinary urgency incontinence (UUI)] was 26.1% in men and 41.2% in women. The overall prevalence of CC was significantly lower in men than in women (15.3 vs 26.3%), but both men and women with OAB were significantly more likely to report CC (22.3 and 35.9% vs 5.7 and 6.7%, respectively, $P < 0.0001$). The overall prevalence of FI reported 'rarely' or more was 16.7% of men and 21.9% of women. Men and women with OAB were significantly more likely to report FI than those without OAB. FI was also more common in participants with incontinent OAB than in those with continent OAB. Logistic regressions controlling for demographic factors and comorbid conditions suggest that OAB status is a very strong predictor of CC, FI and

overlapping CC and FI (odds ratios, range 3.55–7.96).

CONCLUSIONS

Chronic constipation, FI and overlapping CC and faecal incontinence occur more frequently in patients with OAB and should be considered when evaluating and treating patients with OAB. These findings suggest a shared pathophysiology among these conditions. Additional study is needed to determine if successful treatment of one or more of these conditions is accompanied by commensurate improvement in symptoms referable to the other organ system.

KEYWORDS

constipation, faecal incontinence, overactive bladder, community survey

INTRODUCTION

Overactive bladder (OAB) is a symptomatic condition characterized by urinary urgency,

with or without urgency incontinence, usually with increased daytime frequency and nocturia [1–3]. Previous estimates suggest that the prevalence of overactive bladder

(OAB) ranges from 12 to 22% in Europe, and 16 to 17% in the USA [4–6]. Previous research has established that OAB is associated with substantial symptom burden and impact [6,7].

The prevalence of chronic constipation (CC) in the general population is estimated to be between 2 and 28% and is associated with a substantial burden and impact on health-related quality of life (HRQL) [8]. Limited research in children, the elderly and Asian populations suggests that there is a significant overlap between OAB and CC [9–12], but little data exist regarding the overlap of OAB and CC in the population of the USA. Research suggests that the overlap of urinary symptoms and constipation symptoms should be considered. Charach *et al.* [9] found that treating constipation in elderly patients yielded marked improvements in both constipation and lower urinary tract systems (LUTS), which were associated with positive changes in mood, sexual activity and HRQL [9]. There are a variety of physiological reasons to consider that dysfunction in the bladder and rectum (i.e. OAB and CC/FI) might be related. The tissues of the bladder and rectum share a common embryological origin as well as a common motor nerve supply [13,14]. Additionally, constipation is a commonly reported side-effect of pharmacological treatments for OAB [15].

In addition to CC, a surprising percentage of the general population report FI [16–18]. While the prevalence of FI in general population samples is estimated to be between 2 and 12.1% [16,19–21], the prevalence of FI in OAB patient populations has not been well-characterized. Limited research among women, children, and Asian populations suggests that there is a substantial overlap between OAB and FI [10,17]. It is not clear if the overlap between OAB and CC and/or FI is due to coping mechanisms such as restricted fluid intake [22], which would be present in those with OAB and which lead to CC. The association could also be a shared pathophysiological mechanism, as irritable bowel has been shown to be associated with detrusor overactivity [23].

Given the potential overlap and known burden of each condition, further research is needed to characterize the extent of the overlap between OAB and CC and FI. The objective of the present study was to examine the prevalence of CC and FI in a sample of American men and women aged ≥ 40 years who report symptoms of OAB.

PATIENTS AND METHODS

SURVEY METHODS AND PARTICIPANTS

An internet survey, Epidemiology of Lower Urinary Tract Symptoms II (EpiLUTS II), hosted by YouGovAmerica, was conducted between 8 and 21 September 2008. Men and women aged ≥ 40 years and over from the USA were invited to participate in the self-administered survey. Respondents were required to read US English and be able to access the internet. Respondents participating in a YouGovAmerica survey during the month before study entry, or reporting being currently pregnant or having a urinary tract infection were excluded from survey participation. Sample matching was performed to ensure the population was representative; matching was conducted by age, sex, race/ethnicity and education using the most current (2005) US census data at the time of the study.

EpiLUTS II INTERNET SURVEY

Participants were asked to provide sociodemographic information (e.g. year of birth, sex, height, weight, health care utilization for urinary symptoms in the past 12 months) and to report comorbid conditions (e.g. CC, depression, heart disease, bladder cancer).

The prevalence of OAB was assessed using a definition of presence of urinary urgency and/or urinary urgency incontinence (UUI). Urinary urgency was determined based on the question: 'During the past 4 weeks, how often have you had a sudden need to rush to urinate? By sudden need to rush to urinate we mean a sudden intense feeling of urgency where you feel you must urinate immediately.' Participants responded based on a five-point Likert scale (i.e. 'never', 'rarely', 'sometimes', 'often' or 'almost always'), with the presence of urinary urgency defined as response cut-offs of $\geq$ 'sometimes'. UUI was defined as a 'yes' response to a question: 'During the past 4 weeks, did you leak urine in connection with a sudden need to rush to urinate?' OAB with urgency but no UUI was further categorized as continent OAB; while incontinent OAB was defined as the presence of UUI with or without urinary urgency. Participants with non-OAB LUTS $\geq$ 'sometimes' (e.g. weak stream, terminal dribble, straining) were excluded from the analyses, because the

purpose of this analysis was to obtain a comparison between participants with and without OAB. The inclusion of other LUTS participants would have detracted from the main purpose of the analysis, which was to examine the prevalence of CC in patients with OAB.

The prevalence of CC and its overlap with OAB was assessed using modified Rome III diagnostic criteria, whereby CC was defined as a 'yes' response to two or more of the following seven constipation symptoms for ≥ 6 months: 'fewer than three bowel movements (zero to two) a week'; 'hard or lumpy stools'; 'straining during bowel movements'; 'a feeling of incomplete emptying after bowel movements'; 'a sensation that the stool could not be passed (i.e. blocked) when having a bowel movement'; 'to press on or around your bottom or remove stool in order to complete a bowel movement'; and 'difficulty relaxing or letting go to allow the stool to come out during a bowel movement'.

The prevalence of FI was assessed by the question, 'How often do you experience the accidental loss of stool?' Participants responded on a five-point Likert scale ranging from 'never' to 'almost always'; FI was defined as a response of 'rarely' or more often.

ANALYSES

All statistical analyses were performed using SAS/STAT® version 9.1.3 (SAS Institute Inc., Cary, NC, USA). Sample matching was used to construct population-representative samples of respondents, and post-stratification weights were calculated to correct small imbalances caused by differences in response rates; thus all presented data are weighted. Surveys with missing data (no response on $\geq 2\%$ of survey items) were not included. Demographic variables were evaluated by descriptive analyses; all analyses were conducted separately for men and women. Chi-squared tests were used to evaluate differences in the prevalence of CC and FI between OAB and non-OAB groups, and between continent and incontinent groups, in men and women. Logistic regressions were performed individually on the following dependent variables: CC, FI and the overlap of CC and FI. Each model included age, race, body mass index (BMI) and comorbid conditions as the independent variables. General linear models (GLMs) were used to

TABLE 1 Demographics of participants by overactive bladder (OAB) $\geq$ 'sometimes'

		Men				Women			
		OAB status $\geq$ 'sometimes'				OAB status $\geq$ 'sometimes'			
		Total	No/minimal symptoms	OAB	P value	Total	No/minimal symptoms	OAB	P value
		(N = 927)	(N = 258)	(N = 242)		(N = 1073)	(N = 282)	(N = 442)	
Mean (SD) age, years		56.1 (10.9)	53.3 (9.8)	57.6 (11.0)	<0.0001	56.5 (10.8)	56.0 (10.4)	57.6 (10.8)	0.0433
Race (n, %)	White	693 (74.7%)	192 (74.6%)	166 (68.5%)	0.0143	837 (78.0%)	211 (74.6%)	358 (81.0%)	0.1346
	Black	97 (10.5%)	23 (8.7%)	41 (17.1%)		103 (9.6%)	27 (9.6%)	42 (9.6%)	
	Asian	30 (3.2%)	10 (4.0%)	2 (0.9%)		31 (2.9%)	14 (5.0%)	12 (2.7%)	
	Hispanic	96 (10.4%)	30 (11.8%)	31 (12.7%)		84 (7.9%)	27 (9.6%)	25 (5.7%)	
	Other	11 (1.2%)	2 (0.8%)	2 (0.8%)		17 (1.6%)	3 (1.2%)	4 (1.0%)	
Marital status (n, %)	Single	98 (10.6%)	29 (11.3%)	24 (10.0%)	0.8452	72 (6.7%)	13 (4.5%)	33 (7.4%)	0.3025
	Married/living with partner	681 (73.4%)	193 (74.8%)	175 (72.4%)		666 (62.1%)	186 (65.9%)	269 (60.8%)	
	Divorced	121 (13.0%)	31 (11.9%)	34 (14.2%)		212 (19.7%)	50 (17.7%)	89 (20.0%)	
	Widow/widower	24 (2.6%)	5 (2.0%)	5 (2.1%)		118 (11.0%)	32 (11.5%)	51 (11.6%)	
	Missing	4 (0.4%)	0 (0.0%)	3 (1.3%)		4 (0.4%)	1 (0.4%)	1 (0.1%)	
Education (n, %)	< high school	36 (3.9%)	12 (4.7%)	6 (2.5%)	0.1618	63 (5.8%)	13 (4.6%)	24 (5.3%)	0.6293
	High school graduate	298 (32.1%)	67 (26.0%)	85 (35.2%)		533 (49.7%)	131 (46.3%)	220 (49.7%)	
	Some college, but no degree	205 (22.1%)	56 (21.8%)	57 (23.4%)		205 (19.1%)	53 (18.8%)	81 (18.4%)	
	2-year college degree	66 (7.1%)	19 (7.5%)	18 (7.3%)		60 (5.6%)	18 (6.3%)	32 (7.2%)	
	4-year college degree	179 (19.3%)	58 (22.5%)	43 (17.7%)		131 (12.3%)	46 (16.2%)	52 (11.7%)	
	Postgraduate degree	136 (14.7%)	42 (16.4%)	31 (12.7%)		76 (7.0%)	21 (7.4%)	33 (7.6%)	
	Missing	7 (0.7%)	3 (1.2%)	3 (1.3%)		4 (0.4%)	1 (0.4%)	1 (0.1%)	

All N values presented are weighted; subgroups may or may not equal total N due to rounding or weighted values.

examine the impact of CC and FI on generic HRQL as measured by the Medical Outcomes Study Short Form-12 (SF-12) while controlling for age, race, BMI and comorbid conditions.

RESULTS

Of the 5002 subjects invited via e-mail to participate in the study, 3058 responded (response rate = 62.2% after adjusting for the estimated eligibility rate). A total of 2106 participants completed the survey, of which 2000 were randomly selected, resulting in 927 men and 1073 women included in the randomized, matched strata. For both men and women, the mean age of participants in the OAB group was higher than in the non-OAB group (men, 57.6 vs 53.3 years, $P < 0.0001$; women, 57.6 vs 56.0 years, $P = 0.04$) (Table 1). For the men, there were racial differences across the two groups, with significantly more black men in the OAB group than in the no/minimal symptoms group (17.1 vs 8.7%) and significantly more

white men in the no/minimal symptoms group than in the OAB group (74.6 vs 68.5%; $P = 0.0143$) (Table 1). There were no significant racial differences among women, and no differences in educational level for either sex.

In both men and women, participants in the 'no OAB/minimal symptoms' group were significantly more likely to report no comorbid conditions than patients with OAB $\geq$ 'sometimes' (no comorbid conditions: men, 40.6 vs 10.7%; women, 36.9 vs 16.0%; both $P < 0.0001$) (Table 2). The most common comorbid conditions based on self-report in both men and women were high blood pressure (men, 44.4%; women, 37.9%), and arthritis (men, 26.8%; women, 36.4%); women also frequently reported depression (26.7%). There were many differences in the prevalence of comorbid conditions between the 'no OAB/minimal symptoms' group and the OAB $\geq$ 'sometimes' group, with the OAB group consistently reporting higher degrees of comorbidity. These differences were observed for arthritis, anxiety, depression,

diabetes, heart disease, heart failure, high blood pressure, mobility limitations, neurological conditions and enlarged prostate/prostatitis in men (all, $P < 0.05$) (Table 2). In women, the OAB group was significantly more likely to report arthritis, asthma, anxiety, depression, diabetes, heart disease, other heart conditions, high blood pressure, irritable bowel syndrome (IBS), mobility limitations, other neurological conditions, recurrent urinary tract infections and uterine prolapse (all, $P < 0.05$) (Table 2).

The overall prevalence of OAB, defined as participants experiencing urinary urgency $\geq$ 'sometimes', was 26.1% ($n = 242$) in men and 41.2% ($n = 442$) in women. The number of men with incontinent OAB ($n = 117$, 12.6%) was very similar to the number of men with continent OAB ($n = 125$, 13.5%). However, there were more women with incontinent OAB ($n = 295$, 27.5%) than with continent OAB ($n = 147$, 13.7%).

The overall prevalence of CC was significantly lower for men (15.3%) than for women

TABLE 2 Medical comorbidities of participants by overactive bladder (OAB) $\geq$ 'sometimes'

	Men				Women			
	OAB Status $\geq$ 'sometimes'				OAB status $\geq$ 'sometimes'			
	Total (N = 927)	No OAB/minimal symptoms (N = 258)	OAB (N = 242)	P value	Total (N = 1073)	No OAB/minimal symptoms (N = 282)	OAB (N = 442)	P value
No comorbid conditions	236 (25.4%)	105 (40.6%)	26 (10.7%)	<0.0001	260 (24.3%)	104 (36.9%)	70 (16.0%)	<0.0001
Arthritis	249 (26.8%)	51 (19.8%)	83 (34.1%)	0.0003	391 (36.4%)	76 (26.8%)	192 (43.5%)	<0.0001
Asthma	88 (9.5%)	24 (9.3%)	23 (9.5%)	0.9446	150 (13.9%)	31 (11.1%)	73 (16.5%)	0.0437
Bladder cancer	3 (0.3%)	1 (0.3%)	1 (0.3%)	0.8988	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Chronic anxiety	36 (3.8%)	6 (2.3%)	17 (7.1%)	0.0098	102 (9.5%)	10 (3.4%)	63 (14.2%)	<0.0001
Depression	135 (14.6%)	23 (8.7%)	46 (18.9%)	0.0009	287 (26.7%)	33 (11.7%)	157 (35.6%)	<0.0001
Diabetes	167 (18.0%)	32 (12.4%)	63 (25.8%)	0.0001	144 (13.4%)	28 (10.0%)	67 (15.3%)	0.0436
Heart disease	76 (8.2%)	13 (5.2%)	24 (10.0%)	0.0402	66 (6.1%)	13 (4.5%)	39 (8.9%)	0.0246
Heart attack	29 (3.2%)	2 (0.8%)	5 (2.0%)	0.2600	15 (1.4%)	3 (0.9%)	9 (2.0%)	0.2521
Heart failure	10 (1.1%)	1 (0.3%)	7 (3.0%)	0.0156	9 (0.8%)	3 (1.1%)	6 (1.3%)	0.7796
Bypass surgery or angioplasty	45 (4.9%)	7 (2.8%)	12 (5.2%)	0.1842	23 (2.2%)	4 (1.3%)	10 (2.2%)	0.3751
Heart arrhythmia	19 (2.0%)	4 (1.7%)	5 (2.3%)	0.6440	14 (1.3%)	6 (2.0%)	8 (1.7%)	0.7596
Other heart condition	13 (1.4%)	2 (0.6%)	6 (2.4%)	0.0943	23 (2.2%)	3 (1.1%)	17 (3.7%)	0.0330
High blood pressure	412 (44.4%)	76 (29.5%)	131 (54.3%)	<0.0001	406 (37.9%)	82 (29.2%)	201 (45.4%)	<0.0001
Interstitial cystitis or painful bladder syndrome	1 (0.2%)	0 (0.0%)	1 (0.6%)	0.2160	8 (0.7%)	3 (0.9%)	4 (0.9%)	0.9908
Irritable bowel syndrome	33 (3.5%)	5 (2.1%)	11 (4.5%)	0.1355	112 (10.4%)	18 (6.2%)	61 (13.8%)	0.0014
Mobility limitations	84 (9.0%)	13 (5.2%)	35 (14.5%)	0.0004	112 (10.4%)	10 (3.6%)	63 (14.2%)	<0.0001
Enlarged prostate/prostatitis	133 (14.4%)	6 (2.4%)	55 (22.7%)	<0.0001				
Uterine prolapse					15 (1.4%)	1 (0.2%)	11 (2.4%)	0.0206

All N values presented are weighted; subgroups may or may not equal total N due to rounding or weighted values.

(26.3%, $P < 0.0001$). Both men and women with OAB were significantly more likely to have CC (22.3 and 35.9%, for men and women, respectively) than those without OAB (5.7 and 6.7%, respectively; all, $P \leq 0.0001$) (Table 3). Rates of CC were higher among men with continent OAB than those with incontinent OAB, but were similar among women with continent and incontinent OAB (men, 18.4 vs 26.7%; women, 38.1 vs 34.9%)

The overall prevalence of FI $\geq$ 'rarely' was 16.7% in men and 21.9% in women. Men's responses included 'rarely' (14.7%), 'sometimes' (1.3%), 'often' (0.7%) and 'almost always' (0.1%). Women's responses were 15.7, 5.6, 0.6 and 0% for 'rarely', 'sometimes', 'often', and 'almost always', respectively. The prevalence of FI was significantly greater for participants with OAB than for participants without OAB (men, 28.9 vs 5.5%, $P < 0.0001$; women, 32.4 vs 7.1%; $P < 0.0001$) (Table 3). Men and women with continent OAB reported lower rates of FI than those with incontinent OAB (FI: men, 15.8 vs 43.1%; women, 23.7 vs 36.7%, respectively).

OVERLAP OF CC AND FI

The prevalence of coexisting CC and FI was also examined. Participants with OAB were much more likely than those with no OAB/minimal symptoms to have coexisting FI and CC (Fig. 1). Men with incontinent OAB were more likely to have overlapping FI and CC than those who had continent OAB (11.2 vs 4.7%, respectively), while the proportions with overlapping FI and CC were very similar in women across the continent and incontinent OAB groups (11.9 vs 12.1%, respectively). Overall, the proportion of participants with CC only, FI only and overlapping FI and CC differed significantly by OAB status ($P < 0.0001$ for both men and women; Fig. 1).

LOGISTIC REGRESSIONS

Three sets of logistic regressions were conducted in men and women separately, controlling for demographic variables (age, race and BMI) and comorbid conditions. These analyses were conducted with CC, FI and overlapping CC and FI as the dependent

variables, and OAB status (no OAB/minimal symptoms vs OAB $\geq$ 'sometimes') as the independent variable. CC was predicted most strongly by OAB status in both men (OR = 3.55; 95% CI = 1.79–7.01; $P = 0.0003$) and women (OR = 7.96; 95% CI = 4.51–14.03; $P < 0.0001$) and the discriminative power of these models was moderate (c-index: men, 0.76; women, 0.75). Similarly, FI was predicted most strongly by OAB status in both men (OR = 6.36; 95% CI = 3.24–12.49; $P < 0.0001$) and women (OR = 5.17; 95% CI = 2.89–9.26; $P < 0.0001$), with moderate discriminative power for these models (c-index: men, 0.79; women, 0.76). In the model predicting the overlap of CC and FI, OAB status was again the most important predictor (men, OR = 6.51; 95% CI = 1.69–25.08; $P = 0.0065$; women, OR = 4.97; 95% CI = 1.93–12.78; $P = 0.0009$), and these models also had moderate predictive power (c-index: men, 0.80; women, 0.72). Across all regressions, very few of the demographic variables and comorbid conditions were significant predictors and contributed little to the prediction of CC, FI or the overlap of these two conditions. For the CC model, only depression and OAB were significant

TABLE 3 Frequency of responses to constipation symptoms by overactive bladder (OAB) subgroup using Epidemiology of Lower Urinary Tract Symptoms II (EpiLUTS II) definition $\geq$ sometimes*

	Men			Women		
	No OAB/minimal symptoms (N = 258)	OAB (N = 242)	P value	No OAB/minimal symptoms (N = 282)	OAB (N = 442)	P value
< three bowel movements per week (n, %)	2 (0.9%)	14 (5.9%)	0.0017	12 (4.3%)	33 (7.6%)	0.0736
Hard or lumpy stools (n, %)	24 (9.1%)	42 (17.3%)	0.0071	18 (6.5%)	101 (22.8%)	<0.0001
Straining during bowel movements (n, %)	25 (9.8%)	70 (29.0%)	<0.0001	46 (16.2%)	176 (39.9%)	<0.0001
Feeling of incomplete emptying after bowel movements (n, %)	30 (11.6%)	56 (23.1%)	0.0007	30 (10.6%)	170 (38.4%)	<0.0001
Sensation that stool could not be passed when having a bowel movement (n, %)	9 (3.6%)	39 (15.9%)	<0.0001	11 (3.8%)	122 (27.5%)	<0.0001
Need to press on/around bottom to remove stool (n, %)	5 (2.0%)	21 (8.8%)	0.0006	10 (3.7%)	82 (18.6%)	<0.0001
Difficulty relaxing to allow stool to come out during bowel movements (n, %)	3 (1.1%)	12 (5.1%)	0.0097	6 (2.1%)	65 (14.7%)	<0.0001
Met Rome III criteria† (n, %)	15 (5.7%)	54 (22.3%)	<0.0001	19 (6.7%)	159 (35.9%)	<0.0001
Faecal incontinence $\geq$ 'rarely' (n, %)	14 (5.5%)	70 (28.9%)	<0.0001	20 (7.1%)	143 (32.4%)	<0.0001

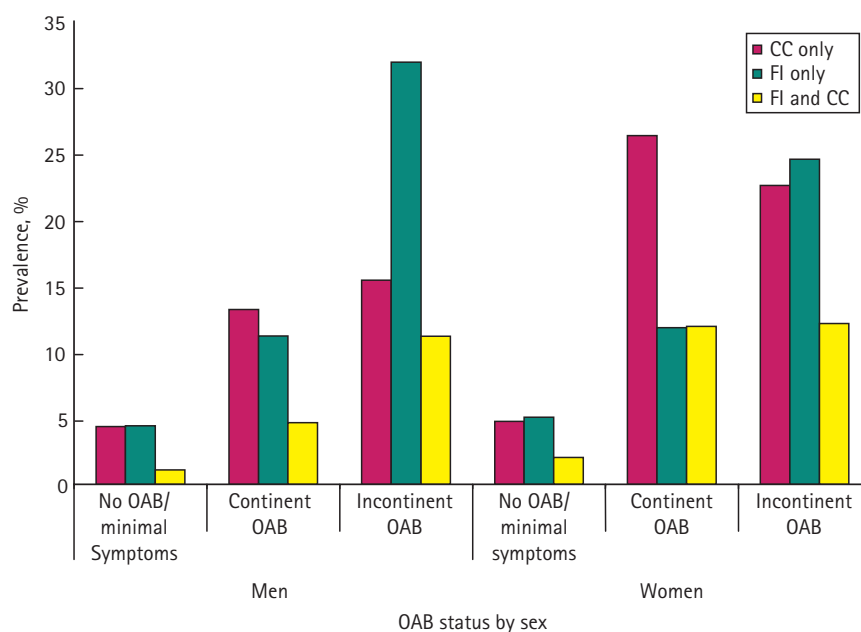
*Table includes only participants who had no OAB and minimal LUTS (no/minimal symptoms), and those who had OAB. Participants who reported other idiopathic LUTS were excluded from the analyses to yield a cleaner contrast between OAB and non-OAB groups. †Must include two or more of the following as 'yes' responses: fewer than three bowel movements (zero to two) a week?; hard or lumpy stools?; straining during bowel movements?; a feeling of incomplete emptying after bowel movements?; a sensation that the stool could not be passed, (i.e. blocked), when having a bowel movement?; to press on or around your bottom or remove stool in order to complete a bowel movement?; difficulty relaxing or letting go to allow the stool to come out during a bowel movement?; and at least two of the symptoms must have been present for at least 6 months.

predictors in men (both $P \leq 0.03$) whereas increased BMI, Hispanic and black race, hypertension, IBS, mobility limitations and OAB (all $P \leq 0.04$) were significant for women. In the FI model, decreased age and OAB were significant for men, while increased BMI ($P = 0.04$), IBS and OAB (both $P < 0.001$) were significant for women. For the model of CC and FI, OAB was the only significant predictor ($P = 0.007$) for men, while hypertension ($P = 0.008$) and OAB ($P = 0.0009$) were significant predictors for women.

HEALTH-RELATED QUALITY OF LIFE

Health-related quality of life outcomes were assessed using the SF-12 Physical Component Summary Score (PCS) and the SF-12 Mental Component Summary Score (MCS) (Table 4). In general, there was a consistent trend of participants in the no OAB/minimal symptoms group reporting the highest scores, participants with OAB only reporting lower scores, and participants with OAB and overlapping CC, FI, or CC and FI reporting the lowest scores. Many of the *post hoc* comparisons among the groups were significant, most commonly between the no OAB/minimal symptoms group and

FIG. 1. Chronic constipation (CC) and faecal incontinence (FI) by overactive bladder (OAB) status.



the other groups, suggesting that the largest impacts on HRQL are associated with OAB, while smaller decrements in HRQL are associated with the overlapping conditions.

DISCUSSION

The present study found prevalences of OAB of 26.1 and 41.2% in men and women

TABLE 4 The impact of overlapping overactive bladder (OAB), chronic constipation (CC) and faecal incontinence (FI) on Health-Related Quality of Life†

	N	Dependent variable	No/minimal symptoms Mean (SD)	OAB only Mean (SD)	OAB + overlap Mean (SD)	OAB post hoc results‡,§	Significant predictors of decreased PCS or MCS§
<i>Chronic constipation</i>							
Men	503	PCS	50.8 (9.6)	44.8 (12.7)	41.1 (10.0)	b*	↑Age, ↑BMI, arthritis, mobility limitation, neurological condition, sleep apnoea, OAB and CC status
	503	MCS	52.6 (8.6)	48.3 (12.6)	43.4 (10.9)	a**, b***, c*	↓Age, ↓BMI, anxiety, depression, neurological condition, OAB and CC status
Women	659	PCS	50.2 (9.7)	43.1 (12.4)	40.2 (11.3)	a***, b***	↑BMI, other race, arthritis, anxiety, depression, diabetes, heart, mobility limitation, neurological condition, sleep apnoea, OAB and CC status
	659	MCS	51.2 (9.9)	47.0 (11.8)	43.6 (12.6)		↓Age, Black race, anxiety, depression, IBS, sleep apnoea
<i>Faecal incontinence</i>							
Men	502	PCS	50.7 (9.6)	45.5 (11.4)	40.4 (12.8)		↑Age, ↑BMI, arthritis, mobility limitation, neurological condition, sleep apnoea
	502	MCS	52.6 (8.6)	47.0 (12.6)	47.9 (11.5)	a***	↓Age, ↓BMI, anxiety, depression, neurological condition, bladder infection, OAB and FI
Women	659	PCS	50.2 (9.7)	42.5 (11.9)	41.2 (12.3)	a***, b*	↑Age, BMI, other race, arthritis, anxiety, diabetes, heart, mobility limitation, neurological condition, sleep apnoea, OAB and FI
	659	MCS	51.2 (9.9)	47.2 (12.5)	42.8 (11.0)	b*	↓Age, Black race, anxiety, depression, OAB and FI
<i>Chronic constipation and faecal incontinence</i>							
Men	502	PCS	50.8 (9.6)	45.5 (11.4)	40.4 (12.8)		↑age, ↑BMI, arthritis, mobility limitation, neurological condition, sleep apnoea, prostatitis
	502	MCS	52.6 (8.6)	47.0 (12.6)	47.9 (11.5)	a***	↓age, ↓BMI, anxiety, depression, neurological condition, bladder infection, OAB and CC and FI
Women	659	PCS	50.2 (9.7)	42.5 (11.9)	41.2 (12.3)	a***, b*	↑age, ↑BMI, other race, arthritis, anxiety, diabetes, heart, mobility limitation, neurological condition, sleep apnoea, OAB and CC and FI
	659	MCS	51.2 (9.9)	47.2 (12.5)	42.8 (11.0)	b*	↓age, black race, anxiety, depression, OAB and CC and FI

†General linear model controlling for age, body mass index (BMI), race and comorbid conditions (men: arthritis, asthma, bladder cancer, anxiety, depression, diabetes, heart, hypertension, cystitis, IBS, mobility, neurological conditions, bladder infection, sleep apnoea, prostatitis, and prostate cancer; women: arthritis, asthma, bladder cancer, anxiety, depression, diabetes, heart, hypertension, cystitis, irritable bowel syndrome (IBS), mobility, neurological conditions, bladder infection, sleep apnoea and uterine prolapse). §Significance indicated by *P < 0.05, **P < 0.01, ***P < 0.001. §Post hoc comparisons: Scheffe's post hoc comparisons: a, no/minimal symptoms vs OAB only; b, no/minimal symptoms vs OAB + overlap; c, OAB only vs OAB + overlap. PCS, SF-12 Physical Component Summary Score; MCS, SF-12 Mental Component Summary Score.

respondents, respectively. The presence of OAB was directly associated with older age and the presence of comorbid conditions. Similarly, the overall prevalences of CC were 15.3 and 26.3% in men and women, respectively, and the prevalences of FI were 16.7 and 21.9% in men and women, respectively. Both of these latter conditions were more likely to be present when OAB

was also present. The results of the present study suggest that there is a high prevalence of both CC and FI among men and women with symptoms of OAB, which is significantly higher than the prevalence of CC and FI in those without OAB. This is consistent with previous reports of the overlap of these conditions [10,17,24,25]. In Chung *et al's* [10] study of 16 516 Korean

children aged 5–13 years, children with OAB were more likely to have both constipation (6.2%) and FI (9.7%) than children without OAB [10]. Similarly, in a study of 3799 women in the USA aged 25–84 years who were recruited through an HMO, a total of 13.3% reported having OAB, while 24.9% reported having FI [17]. Overlapping OAB and FI was present in 7.4% of the total

sample [17], which is lower than our findings but may reflect data collection methods and classification. Importantly, in the logistic regression models, assessing factors associated with CC alone, FI alone and CC and FI while controlling for age, race, BMI and comorbid conditions, OAB status was the only consistently significant and strong predictor of each outcome, demonstrating the key importance of OAB.

The relationship between OAB symptoms and IBS has been documented in previous reports [26,27] but remains poorly understood. The frequent coexistence of functional urinary and gastrointestinal symptoms suggests the possibility of a common aetiology between these common disorders. In one study, Monga *et al.* [23] performed twin-channel cystometry as well as oesophageal balloon distension testing in premenopausal women with IBS and compared bladder and oesophageal sensory thresholds with those obtained in women without IBS [23]. The IBS patients in this study were significantly more likely to experience urinary frequency and urgency and also to have the urodynamic finding of detrusor instability than non-IBS patients, but no linkage between the sensation of bladder fullness and oesophageal perception or between maximum bladder capacity and oesophageal pain thresholds could be shown, prompting these authors to hypothesize that the common linkage between the two organ systems is most probably a smooth muscle disorder. In another experiment, Mills *et al.* [28] found that isolated strips of detrusor muscle from patients with symptoms of detrusor instability developed greater spontaneous tone and more spontaneous fused tetanic contractions than control strips. Moreover, strips from patients with detrusor instability were less responsive than controls to nerve stimulation and showed evidence of reduced staining of presumed cholinergic nerves. Thus far, identification of a common aetiology which could lend itself to therapeutic intervention directed at both organ systems concomitantly has proven elusive.

The relationships between OAB symptoms and other gastrointestinal disorders, such as CC and FI, have not been as well studied as OAB and IBS, although it is entirely reasonable to suspect a similar prevalence pattern. One recent report in the paediatric literature found prevalence

rates of 22.6% for constipation, 4.4% for FI and 10.5% for UI at a primary care clinic in the USA [29]. Children with constipation had higher prevalence rates for FI and UI than children without constipation, and boys with constipation had higher rates of FI than girls with constipation. In another study of 234 children with CC, relief of constipation resulted in the disappearance of daytime urinary incontinence in 89% of the children and night-time urinary incontinence in 63% of the children [30].

In addition to examining the prevalence of CC and FI in adult participants with and without OAB, the present study included comparisons between continent and incontinent OAB groups. Continent and incontinent OAB might distinguish participants based on the severity and/or the pathophysiology of their disorder. The results of these comparisons suggest that in men, both FI and overlapping CC and FI are more prevalent for men with incontinent OAB. By contrast, for women, FI was more prevalent in the incontinent OAB group, but the prevalences of CC alone and overlapping CC and FI were not different between women with continent and those with incontinent OAB. These results suggest that FI occurs more frequently in both men and women with incontinent OAB, which could also be related to shared physiological factors. As noted previously, dysfunction in the bladder and rectum (i.e. OAB and CC/FI) may be related due to common embryological tissue origin and a shared motor nerve supply [13,14] as well as a known association of IBS with detrusor overactivity [23] and increased rectal sensation being associated with increased bladder sensation in normal subjects [31]. The overlap of CC and FI, particularly in the context of the greater prevalence in people with OAB is less easily understood. Potential explanations might include failed attempts to deal with CC through the overuse of laxatives resulting in FI, or incidents of 'overflow' as a consequence of very severe constipation. Future research exploring the specific aetiology and reasons for the overlap is necessary.

The limitations of the present study are primarily related to its cross-sectional design and diagnoses being based on self-reported symptoms rather than physician diagnoses. The sensitivity and specificity of self-reported OAB using the questions from this survey are not known. The treatment status of the

participants with OAB was not assessed, and thus information relating to possible side-effects of anti-muscarinic agents causing CC was not obtained, but relatively few people with symptoms of OAB in the community are taking this medication [32]. However, participants may also be taking medications for other conditions (e.g. antidepressants) which might cause constipation. Additionally, respondents to this survey are members of a panel of participants who regularly complete internet-based surveys and these participants may not be representative of the general population, despite the efforts that were made to match the sample demographically to the general population of the USA.

In conclusion, CC and FI are more common in people with OAB than in those without OAB. Given this increased prevalence, healthcare providers treating patients with OAB should include assessments to determine whether patients are affected by these overlapping and burdensome gastroenterological conditions. Similarly, clinicians evaluating patients presenting with symptoms of CC and/or FI should enquire about symptoms of OAB. As the specific aetiology and reasons for the overlap of CC and FI with OAB are not definitively known, this area of research merits further investigation.

CONFLICT OF INTEREST

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- Abbreviations:** BMI, body mass index; CC, chronic constipation; EpiLUTS II, Epidemiology of Lower Urinary Tract Symptoms II; FI, faecal incontinence; GLM, general linear model; HRQL, health-related quality of life; OAB, overactive bladder; UUI, urinary urgency incontinence; LUTS, lower urinary tract systems.