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Fecal incontinence in US women: A population-based study

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KEY WORDS
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Objective: The purpose of this study was to determine the prevalence of fecal incontinence (FI) and associated risk factors in a broad age range of community-dwelling women.
Study design: This was a population-based, age-stratified postal survey of 6000 women aged 30 to 90 years enrolled in a large HMO in Washington State. Sample was linked to longitudinal automated medical data. FI was defined as loss of liquid or solid stool at least monthly.
Results: The response rate was 64%. The prevalence of FI was 7.2%; prevalence increased notably with age. Women with FI reported significant lifestyle alteration and functional disability. Older age (adjusted odds ratio [OR] 2.11-2.22), major depression (OR 2.73), urinary incontinence (OR 2.32), medical comorbidity (OR 1.76-2.58), and operative vaginal delivery (OR 1.52) were significantly associated with increased odds of FI.
Conclusion: In this large report of US community-dwelling women, FI was a prevalent condition. Age, major depression, urinary incontinence, medical illness, and operative vaginal delivery were strongly associated with likelihood of FI.

Fecal incontinence (FI) is commonly defined as the accidental loss of liquid or solid stool.[1] Several studies have documented the quality-of-life (QOL) impact of this embarrassing and socially isolating condition.[2-4] Only a minority of patients with FI, however, report their symptoms to their physician.[5] Efforts to document the community-based prevalence of FI have been difficult,[1] leading many investigators to examine specific populations, such as postpartum women,[6,7] or limited potential risk factors, such as delivery type[7,8] and urinary incontinence (UI).[8,9]

Among studies of community-dwelling adults, FI is estimated to affect 2% to 13% of respondents,[2,3,9-12] with rates varying depending on the definitions and data collection methods utilized. Higher prevalence rates are found in studies requiring as few as 1 accident in the last year for a positive response,[3,9] while lower rates are found with data collection methods that lack anonymity, such as in-person interviews.[12]

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Studies reporting on subpopulations of women estimate FI prevalence at 3% to 10%.[2,3,12] FI in women is of particular interest because of the potential impact of childbirth and common pelvic surgeries, like hysterectomy, on bowel function. In epidemiologic studies, increasing age[2,3,11] and UI[8,9] have been consistently associated with FI, while operative vaginal delivery,[7,8,13] cesarean section,[14] and hysterectomy[15] have yielded conflicting or uncertain results. Most studies have been unable to link survey data to medical findings, such as physician diagnoses, and large epidemiologic surveys have not been performed in community-based samples of women in the US, where different risk factors may predominate. This study's objectives were to determine the prevalence of and factors associated with FI in a population-based sample of community-dwelling women aged 30 to 90 years.

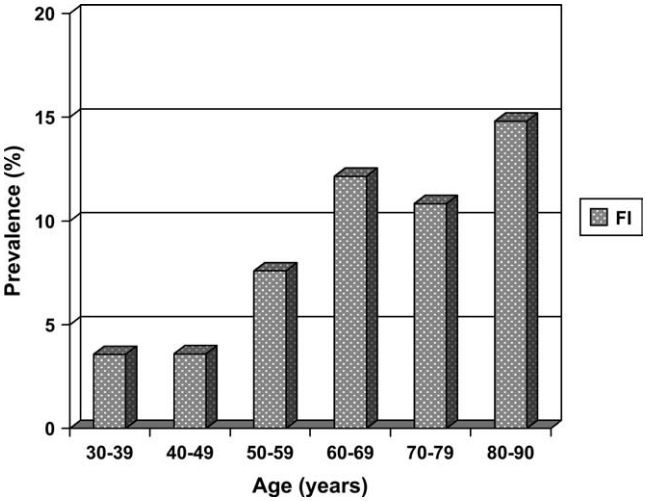

Figure 1 Prevalence of fecal incontinence by decade of age.

Material and methods

The participants of this 2002 study were female enrollees of Group Health Cooperative (GHC), a health maintenance organization serving approximately 550,000 individuals in Washington State. GHC enrolls 1-in-10 Washington residents and provides traditional group and individual care plans, as well as Medicare, Medicaid, and government employee coverage. A 15-page self-report form was mailed to an age-stratified random sample of 6000 female enrollees aged 30 to 90 years. The survey contained questions about medical, surgical, obstetric, and gynecologic history; medications; bowel and bladder symptoms; depressive symptoms; functional status; QOL; and demographics. Exclusion criteria were inability to locate, death, disenrollment from GHC, paralysis, mental or physical barriers to completing a questionnaire, and current urinary tract infection (UTI). An initial and 2 reminder questionnaires were sent. The sample was linked to longitudinal automated data, including inpatient and outpatient diagnoses, which was available for respondents and nonrespondents. Participants provided informed consent, and the GHC Human Subjects Committee approved the study.

Frequency of stool loss was characterized as never, less than monthly, monthly, or weekly, with separate inquiries into loss of liquid and solid stool. FI was defined as loss of liquid or solid stool occurring at least monthly. Participants were asked whether they wore a pad or altered their lifestyle because of stool loss. The questions were adapted from the Wexner Continence Grading Scale,[16] which correlates well with clinical impression of FI.[17] Participants also reported their number of bowel movements per week and their predominant stool type (normal, constipated, diarrhea, or combined).

Frequency of urine loss was characterized as never, less than monthly, monthly, weekly, or daily. Amount of urine lost was quantified as a few drops, a small, moderate, or large amount. UI was defined as leakage of any amount occurring at least monthly. We characterized the degree of UI (mild, moderate, severe) using the Sandvik severity index,[18] which has been validated against pad-weighing tests.[18]

The categorical variables of race, ethnicity, education, income, employment, smoking, alcohol use, menopausal status, and history of hysterectomy were assessed by self-report. Self-reported height and weight were used to calculate body mass index (BMI) in kg/m^2. Respondents were asked to list each child birth, delivery type, whether a forceps or vacuum-assisted device was used, whether an episiotomy or vaginal laceration occurred, and infant birth weight. Delivery types were categorized by theoretical risk of pelvic floor injury as nonoperative vaginal deliveries only; cesarean deliveries only; history of any operative vaginal delivery; and other mixed/unknown delivery type.

Current major depression was diagnosed with the PRIME-MD Patient Health Questionnaire 9-item (PHQ-9),[19] which has excellent agreement with diagnosis of major depression by structured interview.[19] GHC automated data were used to determine the presence of diabetes mellitus, and to generate the RxRisk chronic disease score, a measure of medical comorbidity based on prescription drug use for the previous year.[20] The questionnaire also included the World Health Organization Disability Assessment Schedule II (WHO-DAS II), a functional status measure assessing disability, reported as a continuous score.[21]

Statistical analyses were performed using Stata version 8.1 (Stata Corporation, College Station, TX). Descriptive statistics were used to characterize the overall sample and participants with and without FI. FI prevalence rates were calculated for the study population according to decade of age. A population-based

Table I Characteristics of respondents*

Characteristic	Total (n = 3444)	No FI (n = 3195)	FI (n = 249)	f or χ^2 statistic†	*P* value
Age	52.9 ± 16.5	52.2 ± 16.3	61.9 ±16.3	81.67	< .001
BMI (mean)	27.4 ± 6.7	27.2 ± 6.5	29.3 ± 8.3	21.23	< .001
RxRisk Score (mean)‡	2270 ± 2049	2166 ± 1937	3600 ± 2833	116.97	< .001
Urinary incontinence	42.4% (n = 1426)	40.4% (n = 1260)	69.5% (n = 166)	76.87	< .001
Major depression	3.8% (n = 126)	3.2% (n = 101)	10.5% (n = 25)	32.45	< .001
Diabetes	6.6% (n = 227)	5.9% (n = 188)	15.7% (n = 39)	35.88	< .001
Non-white race	13.1% (n = 442)	13.3% (n = 416)	10.7% (n = 26)	1.39	.238
Education (≤high school)	20.8% (n = 712)	20.0% (n = 635)	31.1% (n = 77)	17.00	< .001
Current smoker	9.2% (n = 312)	9.1% (n = 285)	11.2% (n = 27)	1.23	.267
Moderate alcohol (≥3 drinks/wk)	19.5% (n = 661)	20.1% (n = 632)	12.0% (n = 29)	9.22	.002
Peripostmenopausal	57.1% (n = 1898)	55.1% (n = 1703)	83.0% (n = 195)	69.14	< .001
H/O hysterectomy	20.7% (n = 704)	19.4% (n = 612)	38.3% (n = 92)	48.65	< .001
H/O vaginal hysterectomy§	33.7% (n = 246)	34.5% (n = 203)	37.9% (n = 33)	0.36	.549
Deliveries (mean #)	2.0 ± 1.5	2.0 ± 1.5	2.42 ± 1.6	20.67	< .001
Delivery type				17.65	.001
Nonoperative vaginal deliveries only‖	43.2% (n = 1488)	43.4% (n = 1388)	40.2% (n = 100)		
Nulliparous (no deliveries)‖	19.4% (n = 668)	19.8% (n = 632)	14.5% (n = 36)		
H/O operative vaginal delivery‖	24.4% (n = 840)	23.7% (n = 757)	33.3% (n = 83)		
Cesarean sections only‖	6.9% (n = 238)	7.1% (n = 228)	4.0% (n = 10)		
Unknown/mixed birth type‖	6.1% (n = 210)	6.0% (n = 190)	8.0% (n = 20)		

* Includes survey respondents who completed questions necessary for a diagnosis of FI.
† Comparing respondents with and without FI: df for χ^2 is 1; df range for f is 3339 to 3444.
‡ Medical comorbidity measure.
§ Among those with history of a hysterectomy.
‖ Delivery type categories.

prevalence was also calculated, according to the age distribution of GHC's total female population. Bivariate comparisons of variables by FI status were conducted using chi-square tests for categorical variables and analysis of variance (ANOVA) for continuous variables. Using factors determined a priori and significant factors from the bivariate analyses, we created a series of multivariate logistic regression models to predict odds of FI among women.

To assess potential response bias, we examined differences between survey respondents and nonrespondents using automated data. We estimated the probability of being a respondent as a function of the following: age, RxRisk score, primary care visits, depression diagnosis, and diabetes diagnosis. We used a weighted analysis with weights inversely proportional to the estimated probability of response, rescaled to sum to the observed sample size. In this analysis, persons with a low probability of responding are given a higher weight to represent the larger number of nonrespondents with similar characteristics. Our comparison of weighted and unweighted analyses showed negligible differences in survey estimates; therefore, we report analyses based on observed data.

Results

Reasons for ineligibility were death (n = 34), invalid address (n = 162), mental/physical barriers (n = 151), disenrollment from GHC (n = 96), paralysis (n = 9), and current UTI (n = 17). Of the remaining 5531 potential participants, 3536 returned the questionnaire for a response rate of 64%.

The prevalence of FI among respondents was 7.2%. After adjusting for oversampling the youngest age groups, the population-based prevalence was 7.7%. Prevalence increased markedly with age (Figure 1). Among women with FI, 63% reported monthly and 37% reported weekly FI episodes. Loss of liquid stool was reported by 47% of women with FI, loss of solid stool was reported by 23%, and loss of both liquid and solid stool was reported by 30%. Seventy percent of participants with FI had comorbid UI, and 12% of participants with UI had comorbid FI. Further analysis by UI severity revealed comorbid FI in 8% of women with mild UI, 15% of women with moderate UI, and 26% of women with severe UI.

Women with fecal incontinence were older, had higher BMIs, had a higher number of deliveries, and

Table II Adjusted odds of FI

Predictor	Adjusted Odds Ratio	95% CI	*P* value
Age			
50-69*	2.11	1.47-3.03	< .001
70-90*	2.22	1.47-3.36	< .001
Major depression	2.73	1.67-4.51	< .001
Urinary incontinence	2.32	1.70-3.15	< .001
Medical comorbidity			
Moderate†	1.76	1.13-2.73	.012
High‡	2.58	1.66-4.01	< .001
Birth type			
H/O operative vaginal delivery§	1.52	1.09-2.12	.014
Cesarean deliveries only§	0.87	0.42-1.80	.706
Mixed/unknown delivery types§	1.44	0.82-2.54	.202
Nulliparity§	1.35	0.88-2.08	.167
BMI			
Overweight (BMI 25-29)‖	0.95	0.64-1.40	.780
Obese (BMI >29)‖	1.38	0.99-1.93	.054

* Reference group age 30 to 49.
† RxRisk score in 2nd tertile; reference group RxRisk score 1st tertile.
‡ RxRisk score in 3rd tertile; reference group RxRisk score 1st tertile.
§ Reference group H/O nonoperative vaginal deliveries only.
‖ Reference group BMI <25.

were more likely to have current UI (Table I). They were more likely to have a previous hysterectomy, greater medical comorbidity, including major depression and diabetes, and a history of operative vaginal delivery. Information on vaginal laceration or episiotomy could not be analyzed because 19.8% of women did not know or did not remember if laceration or episiotomy had occurred. In the final logistic regression model, older age, increasing medical comorbidity, current major depression, current UI, and history of operative vaginal delivery were associated with increased odds of FI (Table II).

One half of women with FI reported a QOL impact attributable to their stool incontinence, with 47% reporting use of a pad and 53% reporting alteration of their lifestyle. Functional status was also affected, with women with FI reporting significantly higher mean WHO-DAS II scores, indicating greater functional disability, than women without FI (23.8 vs 10.9; f(1, 3442) 186.65, P < .001).

Bowel habits also differed among women with and without FI. Women with FI reported a significantly higher mean number of bowel movements per week (14.1 vs 8.1; f(1, 3380) 218.73; P < .001). Women with FI were also significantly more likely to report ≥15 bowel movements per week (Figure 2) and a greater percentage of abnormal stool types (Figure 3).

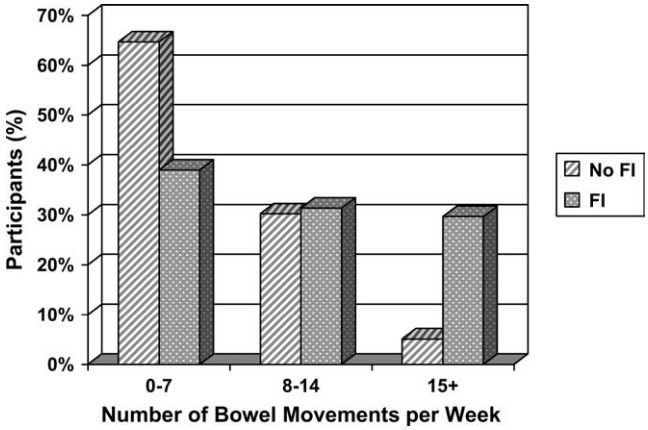

Figure 2 Number of bowel movements per week, comparing respondents with and without FI, Pearson $\chi^2(2) = 218.11$; $P < .001$.

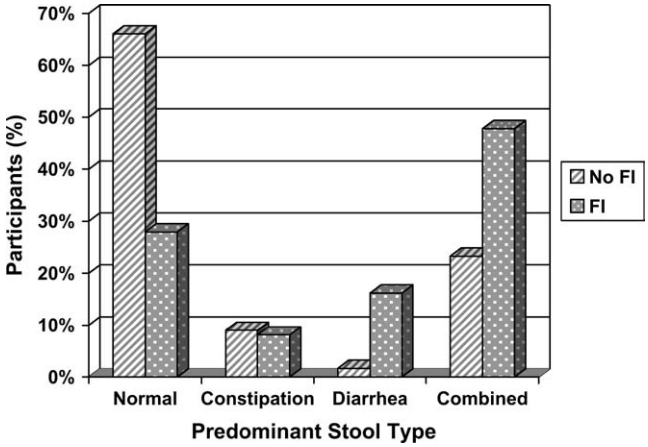

Figure 3 Predominant stool type, comparing respondents with and without FI, Pearson $\chi^2(3) = 285.40$; $P < .001$.

Comment

In this large population-based study of FI, 7% of women reported experiencing loss of liquid or solid stool at least monthly, and the prevalence of FI increased nearly linearly with age. The impact of FI on QOL, alteration of lifestyle, and functional status was significant. Like Perry et al, we found that half of subjects with FI reported that their bowel symptoms had a large impact on their QOL.[2] The women with FI in our study also reported moderate functional impairment, with a mean WHO-DAS II score of 23.8. This is consistent with levels of impairment in individuals with chronic medical conditions like back pain (mean WHO-DAS II score 22.75).[21]

Our study confirms the current evidence for age and UI as factors associated with FI. That aging is highly

associated with FI is an important finding, not only in terms of etiology, but also as an indicator of the services and treatments that will be needed with the aging of our population. Practitioners that care for women, especially those over the age of 50, should be aware of the prevalence of FI and the significant impact it can have on the quality of a woman's life. FI is not present in the majority of elderly women, however, and should not be treated as a normal part of aging. UI was also highly associated with FI, indicating the need to query women who present with UI about possible comorbid FI symptoms.

Our study found a strong association between current major depression and FI, similar to the findings we have observed between major depression and UI.[22] To our knowledge, this is the first study that has examined major depression as a potential risk factor for FI. This link between major depression and FI may be bidirectional. Altered neurotransmitter function in depressed patients could affect the complex bowel innervation, altering gastrointestinal motility or pelvic floor function, leading to FI. Alternately, the embarrassment from loss of stool may lead to progressive social isolation and subsequent depression over time.

Anal sphincter damage after operative vaginal delivery has been well documented. Although higher rates of sphincter damage have been demonstrated with forceps,[23] higher rates of FI have been seen with vacuum deliveries.[8,13] We examined any history of operative vaginal delivery, since self report of exact operative method may not be reliable. We found a history of operative vaginal delivery to be significantly associated with increased odds of FI, compared with a history of only nonoperative vaginal deliveries (OR 1.44 [1.04,1.98]). We did not find having only cesarean deliveries to be associated with decreased odds of FI, confirming a recent report by Chaliha et al that cesarean section is not protective against FI.[14] We were unable to examine the role of episiotomy or laceration because 19.8% of women did not know or did not remember if episiotomy and/or vaginal laceration occurred. Recent evidence suggests that sphincter laceration may be associated with symptoms of FI immediately postpartum, but as women age the prevalence of FI is the same between nulliparous and parous women and between parous women with and without sphincter laceration.[6,7,24] Our study agrees, as nulliparity was not associated with decreased odds of FI. This may indicate that aging plays a more important role than sphincter laceration in the development of FI in women.

Women with FI reported more bowel movements per week and more abnormal stool types when compared with women without FI. These findings may be consistent with a diagnosis of irritable bowel syndrome (IBS), but this cannot be determined from our study. At the time our survey was designed, a self-report instrument providing a diagnosis of IBS was not available. Additionally, many women believe they carry a diagnosis of IBS but do not meet ROME II diagnostic criteria.[25] Because a self-report instrument to diagnose IBS is now available,[25] future epidemiologic studies can carefully examine IBS as a risk factor for FI.

Strengths of this study are the population-based sampling of a large number of women over a broad age range and the accurate assessment of comorbid medical conditions. We also addressed potential responder bias through a propensity analysis, showing that the results are representative of our population. The comprehensive data collected and the large number of participants allow for analysis of many potential risk factors. Limitations already addressed include our inability to evaluate episiotomy or laceration and IBS as potential risk factors for FI. Another limitation is our cross-sectional design, which prevents determination of the causal relationships between FI and associated factors.

With the aging of our population and available treatments for FI, increased attention should be paid to this debilitating condition. Clinicians should have a heightened awareness of the possibility of FI in women with major depression, UI, increased medical comorbidity, and a history of operative vaginal delivery.

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