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Is Pelvic Floor Dysfunction an Independent Threat to Sexual Function? A Cross-Sectional Study in Women With Pelvic Floor Dysfunction

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ABSTRACT

Introduction: Prior studies have reported an association of sexual dysfunction with pelvic floor dysfunction (PFD), but without defining causation.

Aim: To investigate predictors of sexual function in women with PFD, including pelvic organ prolapse, stress urinary incontinence, overactive bladder, obstructed defecation, and fecal incontinence.

Methods: This retrospective cross-sectional study included 755 women (mean age = 56 years, 68% postmenopausal) referred for PFD (2008–2013). Subjects underwent standardized history and examination, including demographics and assessment of pelvic floor function and sexual function using validated quality-of-life instruments. The physical examination included body mass index, Pelvic Organ Prolapse Quantification measurements, and pelvic muscle strength (Oxford scale). Proportional odds regression analysis tested patient characteristics, PFD, and other determinants of sexual dysfunction as predictors of sexual function.

Main Outcome Measures: The Pelvic Floor Distress Inventory (PFDI-20) and Pelvic Floor Impact Questionnaire (PFIQ-7) to assess PFD and the Short Personal Experiences Questionnaire to assess sexual function.

Results: The prevalence of PFD included pelvic organ prolapse (72%), stress urinary incontinence (66%), overactive bladder (78%), fecal incontinence (41%), and obstructed defecation (70%). Most subjects (74%) had a sexual partner and most (56%) reported recent sexual intercourse. Participants reported a low level of sexual desire and sexual enjoyment and moderate levels of sexual arousal and orgasm. When stratified by sexual enjoyment, 46% enjoyed sex and this group had lower PFDI and PFIQ scores, reflecting less quality-of-life burden. Pelvic organ prolapse, obstructed defecation, and fecal incontinence were associated with not enjoying sex. However, when adjusted for other determinants of sexual dysfunction (eg, aging, dyspareunia, atrophy, and partner issues), these associations disappeared.

Conclusion: Women with PFD also have a large burden of sexual dysfunction, although this appears to be mediated by factors not unique to PFD. **Li-Yun-Fong RJ, Larouche M, Hyakutake M, et al. Is Pelvic Floor Dysfunction an Independent Threat to Sexual Function? A Cross-Sectional Study in Women With Pelvic Floor Dysfunction. J Sex Med 2017;14:226–237.**

Key Words: Pelvic Floor Dysfunction; Incontinence; Pelvic Organ Prolapse; Female Sexual Dysfunction; Menopause; Sexual Desire

INTRODUCTION

Sexual dysfunction is an umbrella term used to describe different disorders that negatively affect a person's ability to respond sexually.[1] Sexual dysfunction is a common finding in women older than 40 years seeking routine gynecologic care, because 65.8% of women report at least one complaint.[2] It can

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have a profound effect on health-related quality of life, interpersonal relationships, and individual perception of psychological well-being.[3]

In parallel, at least one in three aging women has pelvic floor dysfunction (PFD).[4] PFD includes involuntary leakage of urine with increased intra-abdominal pressure (stress urinary incontinence; SUI), urinary urgency and frequency (overactive bladder; OAB), pelvic organ prolapse (POP), fecal incontinence (FI), and obstructed defecation (OD). PFD has been associated with decreased sexual function, including decreased sexual arousal, decreased orgasm frequency, and dyspareunia.[5] Given the proximity of the organs affected by PFD to the reproductive tract, it is not surprising that PFD would be associated with sexual dysfunction, although the mechanism for this association is unknown and is likely multifactorial. The objective of this study was to describe sexual function in a large cohort of women with PFD and to evaluate some specific predictors of sexual dysfunction in a sample of women with PFD.

METHODS

This was a retrospective cross-sectional study that was approved by the Providence Health Care Research Ethics Board (H15-00726), an affiliate of the University of British Columbia research ethics board. To assess sexual function in women with PFD, we used a sample drawn from women with PFD who were referred for consultation by one of two urogynecologists at the Centre for Pelvic Floor at St Paul's Hospital (Vancouver, BC, Canada) from January 2008 through August 2013. Inclusion criteria included a completed Short Form of the Personal Experiences Questionnaire (SPEQ) and symptomatic PFD based on the completed validated short form of the Pelvic Floor Distress Inventory (PFDI-20) and Pelvic Floor Impact Questionnaire (PFIQ-7).[6,7] The studied PFD types included SUI, OAB, POP, FI, and, OD. Blank questionnaires or the need for an English interpreter during consultation were exclusion criteria. This was a retrospective investigation of information routinely collected for clinical assessment of patients presenting for PFD. Given the nature of the practice that is focused on PFD, a control group without PFD was not feasible.

All patients underwent a standardized history and examination. The history included the PFDI-20, PFIQ-7, SPEQ, and questions pertaining to age, menopausal status, obstetric history, previous gynecologic surgeries, hormone replacement therapy, smoking and alcohol habits, ethnicity, and relationship status. Patients underwent a standardized physical examination, including height, weight, and body mass index measurements, bimanual examination, rectal examination, Pelvic Organ Prolapse Quantification (POP-Q) measurements, pelvic muscle strength testing (Oxford scale), cough stress test, and postvoid residual measurement.[8,9] The information from paper questionnaires was entered into a database by uniformly trained research assistants. Validity of the database was confirmed by random spot checks of 5% of the data in which the coder was evaluating accuracy.

PFD was defined from PFDI responses and physical examination findings. The PFDI-20 and PFIQ-7 are validated condition-specific quality-of-life instruments for measuring PFD symptoms, associated bother, and impact on quality of life.[6] We chose them because they provide widely recognized objective definitions of different types of PFD. SUI was defined as a nonzero answer to the question, "Do you usually experience urine leakage related to coughing, sneezing, or laughing?" (PFDI-20 question 17), or the presence of a clinically demonstrable positive stress test result at physical examination. OAB was defined as a positive response to symptoms of frequent urination or urine leakage associated with feelings of urgency (PFDI-20 questions 15 and 16). We defined POP in patients with a POP-Q score of 0 (beyond the hymen) or more in the anterior, apical, and posterior vaginal compartments (POP-Q points Aa, Ba, Ap, Bp, C, or D) and a positive response to any question on the Pelvic Organ Prolapse Distress Inventory (PFDI-20 questions 1−6). OD was defined as a positive response to "the feeling of incomplete bowel emptying" or the need to "push on the vagina or around the rectum to have or complete a bowel movement" (PFDI-20 questions 4 and 8), and FI was defined as a positive response to "symptomatic loss of stool beyond a patient's control" (PFDI-20 questions 9−11).

We calculated the PFDI-20 and PFIQ-7 scores and subscale scores according to the original description.[6] For example, the PFDI-20 score was calculated as a summative score from the three subscale components, the pelvic organ prolapse subscale (POPDI), colorectal-anal subscale (CRADI), and urinary distress subscale (UDI). The subscale scores were the mean of the answered questions included in the subscales multiplied by 25 to produce a subscale score of 1 to 100, and the total score of the PFDI-20 scale was up to 300. The PFIQ scores were determined in a similar fashion, that is, as a summative score of the subscales.

To assess sexual function, we used the SPEQ, a validated psychometric tool developed to measure sexual function in women for population-based and clinical trial research.[7] We chose this instrument because it includes questions about all phases of female sexual response, desire, arousal, and orgasm but also measures sexual enjoyment and the frequency of sexual activities. It also addresses key determinants of female sexual dysfunction, for example, partner-related problems, which are addressed by four questions related to the presence of a partner, feelings for the partner, sexual function of the partner, and satisfaction with the partner.[7,10] To broaden the utility of the questionnaire, we added a question to clarify whether they had intercourse with the partner. The SPEQ also addresses another important determinant of sexual function, the presence of dyspareunia. Given the demographics of our population, symptoms related to genital atrophy or poor lubrication also could be important determinants of sexual function; therefore, we further augmented the SPEQ with a question about vaginal dryness. We

Table 1. Sample demographics, examination findings, pelvic floor dysfunction, and sexual function (N = 755)

Variable		Missing, n (%)
Demographics		
Age (y), mean (range)	56.0 (23–90)	2 (0.3)
Ethnicity, n (%)		
Euro-Canadian	627 (85)	
Asian	67 (9)	
First Nation	15 (2)	
Other	29 (3)	
Current smoker, n (%)	55 (7)	
Current EtOH user, n (%)	480 (66)	
Menopause, n (%)		
Premenopausal	283 (32)	
Postmenopausal	510 (68)	
Hormone therapy	111 (21 of postmenopausal)	
Vaginal estrogen	20 (4 of postmenopausal)	
Obstetric history, median (IQR)		3 (0.4)
Gravida	3.0 (2.0–3.0)	
Parity	2.0 (2.0–3.0)	
Vaginal deliveries (n)	2.0 (1.0–3.0)	
Assisted deliveries (n)	0.0 (0.0–1.0)	
Surgical history, n (%)		2 (0)
Hysterectomy	262 (35)	
Prolapse surgery	106 (14)	30 (4)
Incontinence surgery	106 (14)	4 (0)
Physical findings		
BMI (kg/m^2), mean (range)	26.5 (15.6–65.5)	85 (11)
Pelvic muscle strength (normal range = 0–5)		78 (10)
Mean (SD)	2.3 (1.2)	
Median (IQR)	2.0 (1.0–4.0)	
PVR normal (<100 mL), n (%)	516 (86)	157 (21)
Atrophy, n (%)	327 (47)	33 (4)
Pain on examination, n (%)	108 (15)	23 (3)
PFD		
PFDI-20 score (normal range = 0–300), mean (range)	109.6 (0.0–291.7)	4 (0.5)
PFIQ score (normal range = 0–300), mean (range)	74.5 (0.0–300.0)	23 (3)
Stress urinary incontinence, n (%)	479 (66)	34 (5)
Overactive bladder, n (%)	577 (78)	14 (2)
Pelvic organ prolapse, n (%)	442 (72)	14 (2)
Obstructed defecation, n (%)	517 (70)	13 (2)
Fecal incontinence, n (%)	300 (41)	20 (3)
≥2 PFD types, n (%)	506 (91)	197 (26)
Sexual function		
Sexual desire (normal range = 0–6)		151 (20)
Mean (SD)	2.5 (1.3)	
Median (IQR)	2.0 (1.0–3.0)	
Sexual arousal (normal range = 0–6)		155 (21)
Mean (SD)	3.6 (1.7)	
Median (IQR)	4.0 (2.0–5.0)	
Orgasm (normal range = 0–6)		153 (20)
Mean (SD)	3.5 (1.8)	
Median (IQR)	4.0 (1.0–6.0)	
Sexual activity, n (%)		37 (5)
Never	294 (41)	

(continued)

Table 1. Continued

Variable		Missing, n (%)
<1 time/wk	204 (28)	
1–2 times/wk	160 (22)	
>3 times/wk	46 (7)	
1–2/d	6 (1)	
>3 times/d	5 (1)	
Sexual enjoyment (normal range = 0–6)		124 (16)
Mean (SD)	3.3 (1.8)	
Median (IQR)	3.0 (2.0–5.0)	
Enjoys sex, n (%)	292 (46)	
Sexual determinants		
Current partner, n (%)	547 (74)	20 (3)
Sexual intercourse with partner, n (%)	423 (56)	2 (0)
Passionate love for partner		273 (36)
Mean (SD)	4.8 (1.5)	
Median (IQR)	6.0 (4.0–6.0)	
Partner difficulty with sexual performance		269 (36)
Mean (SD)	2.3 (1.8)	
Median (IQR)	1.0 (1.0–4.0)	
Partner satisfaction		276 (38)
Mean (SD)	4.8 (1.5)	
Median (IQR)	5.0 (4.0–6.0)	
Dyspareunia		284 (38)
Mean (SD)	2.7 (1.8)	
Median (IQR)	2.0 (1.0–4.0)	
Vaginal Dryness		162 (21)
Mean (SD)	3.2 (1.9)	
Median (IQR)	3.0 (1.0–5.0)	

BMI = body mass index; IQR = interquartile range; PFD = pelvic floor dysfunction; PFDI-20 = 20-item Pelvic Floor Distress Inventory; PFIQ = Pelvic Floor Impact Questionnaire; PVR = post void residual.

added questions to determine the importance of future sexual function and whether surgical management that precluded future sexual function was acceptable.

To describe sexual function in this population of women with PFD, we report overall enjoyment with sexual activities, frequency of sexual activity, and three domains of sexual function, namely desire, arousal, and orgasm (Table 1). The SPEQ uses a six-point Likert scale from 1 (not at all) to 6 (a great deal). Enjoyment of sexual activity, sexual desire, arousal, and orgasm were based on scores for those individual questions. Frequency of sexual activity was based on the question, "During the past month how often have you had sexual activities?," with possible responses of never, less than once per week, once or twice a week, several times a week, one or twice a day, and several times a day. We also described the prevalence of common determinants of sexual function, including vaginal dryness, dyspareunia, and partner issues. Partner issues were further broken down into the presence of a partner, passionate love for partner, partner problems with sexual performance, satisfaction with partner, and whether they had sexual intercourse with their partner. We examined partner parameters to determine whether they were independent determinants of sexual dysfunction and whether "satisfaction with partner" was a reasonable proxy for other partner parameters. Similarly, we examined dyspareunia and its correlations with vaginal dryness and examination findings of atrophy and pain on examination.

To better understand the role of PFD in sexual dysfunction, we stratified the population by sexual enjoyment by dichotomizing the SPEQ question, "How enjoyable are sexual activities for you?" Using the six-point Likert scale ranging from 1 (not at all) to 6 (a great deal), we defined a parameter, "enjoys sex," as a score of at least 4. To investigate associations between sexual dysfunction and PFDs, we compared those positive for "enjoys sex" to the negatives in terms of PFD. We also investigated associations between specific PFD and different domains of sexual function by correcting for other determinants of sexual dysfunction. To investigate potential mechanisms for how PFD affects sexual function, we sought to describe other determinants of sexual dysfunction in this cohort and account for these factors in assessing decreases in sexual function associated with PFD. We investigated the population of women who were willing to forego future sexual function in seeking treatment for PFD and compared them with those who were not.

Table 2. Comparison of patients with POP who do not have sex with a partner and do not consider future sexual activity important with respect to willingness to undergo an obliterative surgery

		Open to obliterative surgery		
Variable	n	Yes (n = 62)	No (n = 38)	*P* value
Age (y), mean (SD)		69.9 (9.2)	67.9 (10.6)	.324
Missing, n (%)	0 (0)			
Prior UI surgery, n (%)	12	7 (11)	5 (13)	.780
Missing, n (%)	0 (0)			
Prior POP surgery	14	12 (20)	2 (8)	.054
Missing, n (%)	3 (3)			
Presence of partner, n (%)	32	18 (31)	14 (38)	.458
Missing, n (%)	4 (4)			
Passionate love for partner, median	18	3.0 (1.0–6.0)	2.0 (1.0. 4.0)	.416
Missing, n (%)	82 (82)			
Partner limitations, median (SIQR)	20	6.0 (3.0–6.0)	5.0 (1.0–6.0)	.334
Missing, n (%)	80 (80)			
Satisfaction with partner, median (SIQR)	17	2.5 (1.0–6.0)	2.0 (1.0–4.0)	.684
Missing, n (%)	83 (83)			
Sex enjoyment, mean (SD)	58	1.3 (0.9)	1.3 (0.7)	.964
Missing, n (%)	42 (42)			
PFDI score, mean (SD)	99	122.2 (63.3)	115.3 (72.9)	.618
Missing, n (%)	1 (1)			
PFIQ score, mean (SD)	97	89.5 (77.3)	88.7 (84.7)	.961
Missing, n (%)	3 (3)			
Stress UI, n (%)	63	40 (68)	23 (62)	.572
Missing, n (%)	4 (4)			
Overactive bladder, n (%)	80	53 (87)	27 (73)	.085
Missing, n (%)	2 (2)			
POP, n (%)	100	52 (92)	30 (83)	.210
Missing, n (%)	18 (18)			
Obstructed defecation, n (%)	66	41 (71)	25 (66)	.612
Missing, n (%)	4 (4)			
Fecal incontinence, n (%)	48	30 (51)	18 (47)	.738
Missing, n (%)	3 (3)			
≥2 PFD types, n (%)	65	42 (98)	23 (82)	.032
Missing, n (%)	29 (29)			

PFD = pelvic floor dysfunction; PFDI = Pelvic Floor Distress Inventory; PFIQ = Pelvic Floor Impact Questionnaire; POP = pelvic organ prolapse; SIQR = semi-interquartile range; UI = urinary incontinence.

Descriptive statistics included mean values with range and SD. The relation between demographic and clinical characteristics and (i) willingness to undergo an obliterative surgery, (ii) enjoys sex, and (iii) sexual functions were examined, with *P* values based on χ^2 test, Fisher exact test, two-sample t-test, or Wilcoxon rank-sum test as appropriate. Spearman correlation (ρ) was used to assess the strength of relation between pairs of these variables. The scores of sexual enjoyment, sexual activity, and the three domains of sexual function, as measured by the SPEQ, were examined in relation to these patient characteristics using χ^2 trend test or the Jonckheere trend test, as appropriate for *P* values. Proportional odds regression analysis was conducted to examine the trends in sexual function domains with patient demographics, known determinants of sexual dysfunction, physical findings, and PFD status. Where appropriate, data were adjusted for patient demographics, known determinants of sexual dysfunction, and physical findings. All tests were two-sided with an α value of 0.05. Adjustments for multiple tests were not applicable given the single study sample. Number of missing data was indicated as appropriate and missing data were excluded from the analysis.

RESULTS

Demographic and Clinical Characteristics

The cohort included 755 women with a mean age of 56 years; 68% were postmenopausal and 21% used estrogen replacement therapy. Most were white (85%) or Asian (9%) and mean body mass index was 26.5 kg/m^2 (range = 15.6–65.5). Table 1 presents a summary of demographic data and examination

findings and prevalence of PFD. The prevalence of PFD included POP (72%), SUI (66%), OAB (78%), FI (41%), and OD (70%). Most (91%) had at least two conditions. Thirty-five percent had a prior hysterectomy, 14% had prior surgery for UI, and 14% had prior surgery for POP.

Sexual Functioning of Participants

Table 1 also presents sexual function for the cohort. Most women (n = 547; 74%) had a sexual partner and most (n = 423; 56%) answered yes to the question, "Do you and your partner have sexual intercourse?" One-fourth of patients (25%) reported that their partner had difficulty with sexual activity. When asked, "How many times during the past month have you had any sexual activity?," 41% (n = 294) responded never, 28% (n = 204) reported activity less than once per week, and 31% reported activity at least once per week. Responses about sexual desire, arousal, and orgasm yielded a median score for sexual desire that was below the midpoint at 2, whereas the median scores for sexual arousal and orgasm were higher (4 and 4, respectively). Twenty-eight percent reported never having sexual thoughts, 18% never experienced arousal, and 22% never experienced orgasm. The median score for sexual enjoyment was 3.

The analysis of women with POP who did not have sex with a partner and did not consider future sexual activity important and were willing to consider obliterative surgery showed no difference in demographic parameters or partner parameters (Table 2). They also were similar with respect to PFD diagnoses, with the exception that they were more likely to have at least two types of PFD ($P = 0.032$).

Relation Between PFD Severity and Sexual Functioning

To investigate the impact of PFD severity on sexual function, we plotted the mean PFDI and PFIQ scores for the entire cohort in relation to the six-point scores on four sexual domains (Figure 1). Of note, higher scores for the condition-specific quality-of-life questionnaires were significantly associated with lower scores for arousal ($P < .001$), orgasm ($P < .001$), and sexual enjoyment ($P < .001$), but not for sexual desire. To investigate the impact of individual PFDs, we plotted frequency distribution by sexual domain scores on the SPEQ for desire, arousal, orgasm, enjoyment, and frequency of sexual activity (Figure 2). In a normal population, the frequency distribution of the SPEQ scores would be expected to follow a normal distribution; in contrast, in the cohorts with different types of PFD, they were shifted toward lower scores for all conditions. The frequency distributions for patients with multiple pelvic floor disorders were similar (Figure 2).

Relation Between PFD Severity and Sexual Enjoyment

When stratified by sexual enjoyment, 292 (46%) enjoyed sex, whereas 339 (54%) did not. Table 3 presents the distribution of PFD based on enjoyment of sex. In women who enjoyed sex, the

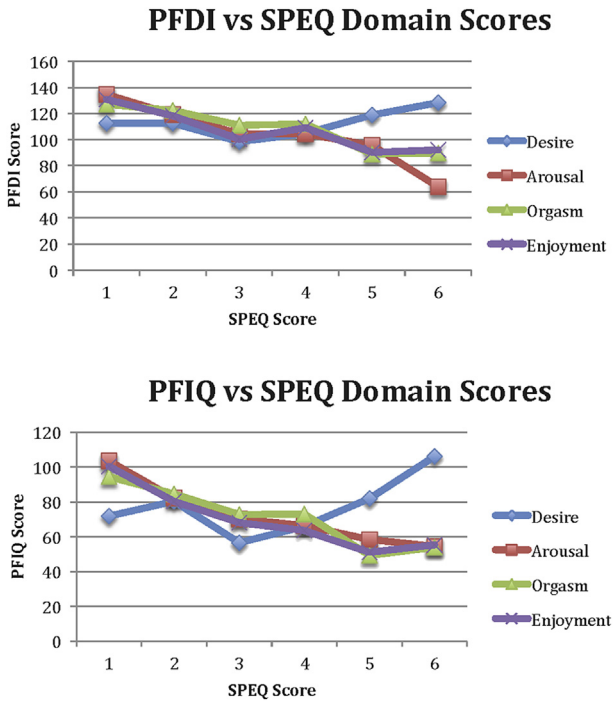

Figure 1. Pelvic Floor Distress Inventory (PFDI) and Pelvic Floor Impact Questionnaire (PFIQ) scores vs Short Personal Experiences Questionnaire (SPEQ) domain scores. Higher PFDI and PFIQ scores correlate with increased bother and impact of pelvic floor dysfunction (PFD) on quality of life. Higher SPEQ scores correlate with increased desire, arousal, orgasm, and enjoyment. Figure 1 is available in color at www.jsm.jsexmed.org.

mean PFDI and PFIQ scores were significantly lower, reflecting less quality-of-life burden compared with women who did not enjoy sex. Furthermore, for specific PFDs, POP ($P < .01$), OD ($P = .043$), and FI ($P = .034$) were associated with not enjoying sex (Table 3).

Relation Between Known Determinants of Sexual Dysfunction and Sexual Function

Table 1 also lists established determinants of sexual dysfunction. Vaginal atrophy was noted in 47% of patients, and dyspareunia was reported by 33.5% of patients. Higher scores for dyspareunia were associated with women using hormone therapy ($P = .023$) and those with pain on examination ($P < .001$) but was not correlated with postmenopausal status or with the finding of vaginal atrophy. Postmenopausal women ($P = .021$), including those on hormone therapy ($P = .010$), were more likely to respond positively to the question about vaginal dryness, yet vaginal dryness was not associated with physical findings of atrophy or pain on examination. Neither vaginal dryness ($\rho = -0.001$) nor dyspareunia ($\rho = -0.307$) correlated with sexual satisfaction.

More than one-fourth of patients (26%) did not have partners. Most patients with partners (79%) felt passionate love for their partners, but 20% were sexually unsatisfied with their partner and 44% reported that they were not sexually active with their

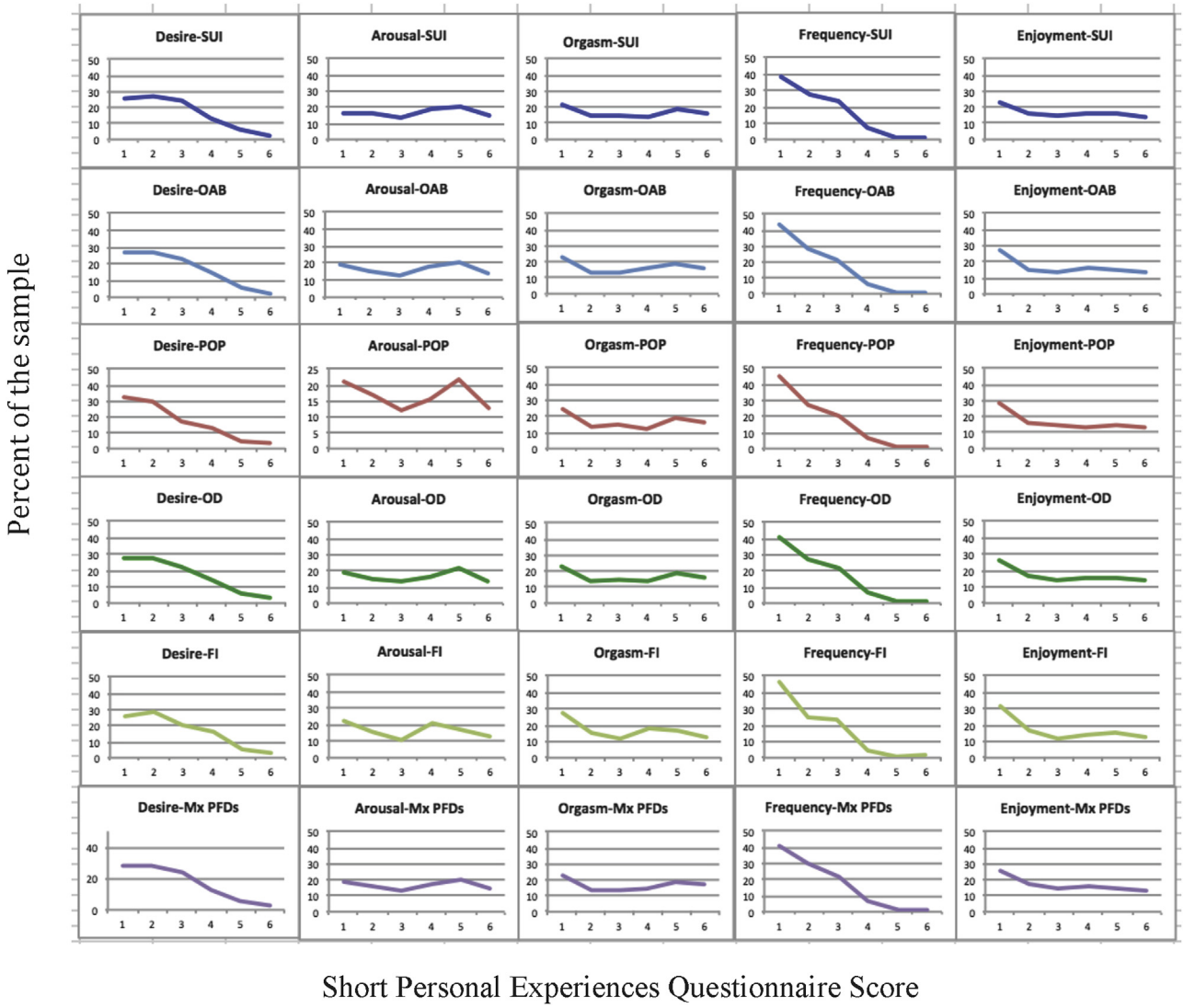

Figure 2. Frequency distribution plots for Short Personal Experiences Questionnaire (SPEQ) domain scores and sexual activity in women with stress urinary incontinence (SUI), overactive bladder (OAB), pelvic organ prolapse (POP), obstructed defecation (OD), fecal incontinence (FI), and multiple pelvic floor disorders (Mx PFD). The SPEQ score is on the x-axis, and a higher SPEQ score correlates with increased desire, arousal, orgasm, and sexual activity. The y-axis represents the percentage of the sample with each score. Figure 2 is available in color at www.jsm.jsexmed.org.

partners. We explored the relation between satisfaction with partner and the other partner parameters. Passionate love for partner was highly positively correlated with satisfaction with partner ($\rho = 0.746$). Conversely, partner difficulty with sexual activity was weakly negatively correlated with satisfaction with partner ($\rho = -0.366$), suggesting that a partner's sexual difficulties, as rated by the woman, was not associated with her level of satisfaction with her partner.

We also investigated the cohort of women who were more sexually active. When the women who were sexually active more than once a week were compared with women who were not, they had higher scores on sexual enjoyment (median = 5 vs 2, $P < .001$), desire (median = 3 vs 2, $P < .001$), arousal (median = 5 vs 3, $P < .001$), and orgasm (median = 5 vs 3, $P < .001$). They were less likely to be postmenopausal (53% vs 75%, $P < .001$) but more likely to be on hormone therapy if they were postmenopausal (34% vs 17%, $P < .001$). They were more likely to have strong pelvic floor muscles ($P = .006$) and higher scores on passionate love for partner and satisfaction with partner. There were no differences in PFD, except for POP, which was less common (64% vs 75%, $P = .006$). There also were no differences in PFDI scores, although the PFIQ scores were lower (62 vs 80, $P < .001$), reflecting less impact of PFD on quality of life.

Unadjusted proportional odds regression data for determinants of sexual functioning based on a decrease of sexual activity and three domains of sexual function (desire, arousal, and orgasm) are listed in Table 4. Increasing age and postmenopausal status were associated with decreased sexual activity and decreases in all three measured aspects of sexual function (eg, desire, arousal, and orgasm). Prior surgery for UI had negative effects on

Table 3. PFDI, PFIQ, and PFD data and their relation to enjoyment of sex

		Enjoys sex		
Variable		Yes (n = 292)	No (n = 339)	*P* value
PFDI score, mean (SD)		97.0 (55.4)	119.3 (61.8)	<.001
Missing, n (%)	3 (0.5)			
PFIQ score, mean (SD)		56.6 (58.4)	86.2 (68.8)	<.001
Missing, n (%)	19 (3)			
Stress urinary incontinence, n (%)		188 (67)	216 (66)	.730
Missing, n (%)	25 (4)			
Overactive bladder, n (%)		215 (76)	265 (79)	.312
Missing, n (%)	12 (2)			
Pelvic organ prolapse, n (%)		144 (61)	212 (78)	<.001
Missing, n (%)	120 (19)			
Obstructed defecation, n (%)		190 (66)	246 (74)	.043
Missing, n (%)	10 (2)			
Fecal incontinence, n (%)		100 (36)	147 (44)	.034
Missing, n (%)	18 (3)			
≥2 PFD types, n (%)		182 (86)	245 (95)	<.001
Missing, n (%)	161 (26)			

PFD = pelvic floor dysfunction; PFDI = Pelvic Floor Distress Inventory; PFIQ = Pelvic Floor Impact Questionnaire.

activity, desire, and orgasm, whereas prior POP surgery had no impact on sexual activity or normal function. Dyspareunia and vaginal atrophy also were associated with decreased sexual activity and function. Increased pelvic muscle strength was associated with more sexual activity and higher desire, arousal, and orgasm. In the postmenopausal subsample, the use of hormone therapy, including vaginal estrogen therapy, improved desire, arousal, and orgasm and increased sexual activity. Important determinants of sexual activity and desire, arousal, and orgasm were partner parameters, including presence of a partner, passionate love for partner, sexual intercourse with partner, and satisfaction with partner. Partner difficulty with sexual activity negatively affected sexual activity (odds ratio = 1.3), arousal (odds ratio = 1.18), and orgasm (odds ratio = 1.18) but did not affect desire.

Unadjusted and adjusted proportional odds regression data related to PFD for sexual activity and domains are presented in Table 5. Adjustments were made for age, menopausal status, previous incontinence surgeries, pelvic muscle strength, and other statistically significant sexual determinants including partner parameters, dyspareunia, and vaginal atrophy. Although increasing PFDI and PFIQ scores showed greater likelihood of decreased sexual activity, desire, arousal, and orgasm, these associations disappeared when corrected for other determinants of sexual functioning. This also was true for specific PFD types, which predicted impairments in different domains of sexual function in the unadjusted analysis but not when corrected for other determinants of sexual dysfunction.

DISCUSSION

PFD has long been hypothesized to negatively affect sexual function, yet efforts to investigate this relation have yielded conflicting results.[11–13] Resolving these seemingly contradictory data is complicated by methodologic shortcomings and inconsistent or inadequate outcome measurements. The greatest barrier to assessing the impact of PFD has been the inability to separate known determinants of sexual dysfunction, including issues related to aging and partners. Thus, the aim of this study was to explore the relation between PFD and its associated distress on sexual functioning in a cross-sectional cohort of women with established PFD.

Our analysis showed a high prevalence of sexual dysfunction in this cohort of women with PFD. More than one-fourth of women never experienced sexual desire, approximately 20% never experienced arousal or orgasm, and more than half did not enjoy sex. Moreover, decreasing sexual function was associated with increasing burden of PFD. However, the associations of PFD with sexual dysfunction disappeared when corrected for aging, vaginal atrophy, dyspareunia, pelvic muscle strength, and partner issues. This suggests that there might not be a direct causative relation between PFD and sexual dysfunction; rather, this relation might be moderated by other determinants of sexual dysfunction.

Increasing age is a well-established determinant of sexual function. Older women, like younger women, have a wide range of sexual experience, but a longitudinal study reported that as women age, they experience less sexual activity, a decreased interest in sex, and a decrease in distress about sex.[14–16] Because aging also is a risk factor for PFD, its independent influence on sexual function is unclear, and efforts to separate the impact of the two parameters are limited. A cross-sectional study of older women with PFD confirmed that an increasing pelvic floor burden was associated with decreasing sexual function in this population but did not separate the influence of aging from PFD.[17] A study focused on aging in women found that

Table 4. Unadjusted proportional odds regression for patient characteristics and known sexual determinants in relation to sexual activity and three domains of sexual function

Variable	Decreased activity		Decreased desire		Decreased arousal		Decreased orgasm	
	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value
Age (per 5-y increase)	1.32 (1.25–1.40)	<.001	1.24 (1.17–1.31)	<.001	1.29 (1.22–1.37)	<.001	1.26 (1.18–1.34)	<.001
Postmenopausal	2.87 (2.14–3.85),	<.001	1.82 (1.35–2.46)	<.001	2.96 (2.18–4.01)	<.001	2.69 (1.99–3.64)	<.001
Hormone therapy (in postmenopausal cohort)	0.46 (0.31–0.69)	<.001	0.37 (0.24–0.57)	<.001	0.50 (0.32–0.77)	.002	0.51 (0.33–0.80)	.003
Prior UI surgery	1.83 (1.22–2.74)	.003	1.54 (1.02–2.33)	.041	1.09 (0.72–1.67)	.681	1.55 (1.01–2.36)	.044
Prior POP surgery	0.97 (0.67–1.43)	.891	1.32 (0.86–2.02)	.203	1.02 (0.68–1.54)	.926	1.00 (0.66–1.51)	.984
Presence of partner	0.10 (0.07–0.15)	<.001	0.64 (0.45–0.91)	.014	0.31 (0.21–0.46)	<.001	0.37 (0.25–0.55)	<.001
Sexual intercourse with partner	0.05 (0.03–0.07)	<.001	0.47 (0.35–0.63)	<.001	0.19 (0.14–0.26)	<.001	0.24 (0.17–0.33)	<.001
Passionate love for partner (per 1-U increase)	0.74 (0.66–0.83)	<.001	0.73 (0.65–0.82)	<.001	0.54 (0.47–0.61)	<.001	0.60 (0.53–0.67)	<.001
Partner difficulty with sexual activity (per 1-U increase)	1.30 (1.19–1.43)	<.001	1.07 (0.97–1.18)	.169	1.18 (1.08–1.30)	<.001	1.18 (1.08–1.30)	<.001
Satisfaction with partner (per 1-U increase)	0.69 (0.61–0.78)	<.001	0.83 (0.74–0.94)	.003	0.58 (0.51–0.65)	<.001	0.57 (0.50–0.65)	<.001
Pelvic muscle strength (per 1-U increase)	0.86 (0.79–0.94)	<.001	0.86 (0.78–094)	.001	0.84 (0.77–0.93)	<.001	0.83 (0.75–0.91)	<.001
Dyspareunia (per 1-U increase)	1.17 (1.07–1.29)	<.001	1.10 (1.00–1.21)	.049	1.33 (1.21–1.46)	<.001	1.24 (1.13–1.36)	<.001
Vaginal atrophy	2.44 (1.83–3.25)	<.001	2.45 (1.80–3.33)	<.001	2.64 (1.95–3.59)	<.001	2.18 (1.61–2.95)	<.001
Vaginal pain on examination	1.09 (0.75–1.60)	.655	1.05 (0.71–1.57)	.802	1.32 (0.88–1.97)	.180	1.56 (1.04–2.34)	.033

OR = odds ratio; POP = pelvic organ prolapse; UI = urinary incontinence.

advancing age was primarily associated with a decrease in desire and hypothesized that this decrease in older women might be mediated by the loss of a partner.[15]

Of all components of the female sexual response, decreased desire is most commonly the cause of sexual dysfunction.[18] Moreover, sexual dysfunction does not always cause distress.[18] In our study, desire was not associated with increasing severity of PFD. This could reflect the age of our population, because age is an important moderator of the association between sexual functioning and sexual distress.[2,19] In younger women, desire has been strongly associated with sexual distress compared with middle-age and older women. Moreover, women with sexual distress are more likely to report sexual difficulty related to pelvic floor symptoms.[2]

Dyspareunia is another potential factor that could be increased in women with PFD and was reported by a third of this sample. However, dyspareunia did not correlate with vaginal atrophy, although vaginal atrophy could be a driver of older age's influence on sexual function. We did note improved sexual function in postmenopausal women using hormone therapy, and other investigators have recognized this association.[16] Sexual limitations of partners negatively affected sexual function, although this did not influence sexual desire in our study. This is a logical finding because arousal and orgasm are much more dependent on a sexual partner. Conversely, positive partner parameters and a strong pelvic floor improved sexual function, enjoyment, and activity.

The relatively higher sexual functioning in those with stronger pelvic floor muscles compared with those with weaker pelvic floor muscles has been reported by other investigators. A secondary analysis of a multicenter study to validate a sexual questionnaire noted that strong pelvic floor muscles were associated with more sexual activity and higher sexual functional scores.[20] They also noted that weak pelvic muscle scores were not associated with decreased sexual activity, suggesting that rather than PFD leading to sexual dysfunction, normal pelvic floor function facilitates normal sexual function. Conversely, hypercontracted pelvic floor muscles are associated with dyspareunia and sexual dysfunction.[21,22]

Studies that have sought to establish links between sexual dysfunction and specific anatomic deficits in women with PFD have generally failed.[5] For example, an assessment of the impact of vaginal topography on sexual activity found an association of longer vaginal length with sexual activity but could not show correlation of vaginal topography with sexual function.[23] This has led others to hypothesize that the impact of PFD on sexual function is an indirect influence through a negative impact on body image. The perception of negative body image has been associated with higher PFD burden and lower sexual function.[24,25] It is clear that PFD has a negative impact on body image and a qualitative study of sexual function in women with PFD suggested that decreased body image could have a negative impact on all aspects of the sexual response, desire, arousal, and orgasm.[25,26]

Table 5. Unadjusted and adjusted proportional odds regression for PFDI, PFIQ, and PFD in relation to the four domains of sexual function (adjusted for age, menopausal status, previous incontinence surgeries, pelvic muscle strength, and other statistically significant sexual determinants, including sexual intercourse with partner, satisfaction with partner, partner difficulty with sexual activity, dyspareunia, and vaginal atrophy)

	Decreased activity		Decreased desire		Decreased arousal		Decreased orgasm	
Variable	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value	OR (95% CI)	*P* value
PFDI (per 10-point increase)								
Unadjusted	1.04 (1.02–1.07)	<.001	1.10 (0.99–1.03)	.413	1.07 (1.05–1.10)	<.001	1.08 (1.06–1.11)	<.001
Adjusted	0.99 (0.95–1.02)	.512	0.99 (0.96–1.03)	.670	1.03 (1.00–1.07)	.066	1.06 (1.03–1.10)	<.001
PFIQ (per 10-point increase)								
Unadjusted	1.04 (1.02–1.07)	<.001	1.01 (0.99–1.03)	.413	1.07 (1.05–1.10)	<.001	1.08 (1.06–1.11)	<.001
Adjusted	1.00 (0.96–1.03)	.819	0.99 (0.96–1.03)	.646	1.06 (1.02–1.09)	.003	1.07 (1.03–1.11)	<.001
Stress urinary incontinence								
Unadjusted	0.80 (0.60–1.07)	.137	0.84 (0.62–1.15)	.274	1.10 (0.81–1.49)	.559	1.32 (0.97–1.79)	.074
Adjusted	0.79 (0.51–1.22)	.293	0.94 (0.62–1.44)	.778	1.26 (0.83–1.92)	.276	1.88 (1.24–2.86)	.003
Overactive bladder								
Unadjusted	1.46 (1.06–2.02)	.022	0.94 (0.66–1.33)	.727	1.48 (1.06–2.09)	.023	1.60 (1.14–2.26)	.007
Adjusted	0.98 (0.61–1.57)	.924	0.81 (0.50–1.30)	.373	0.98 (0.62–1.55)	.920	1.41 (0.89–2.24)	.142
Pelvic organ prolapse								
Unadjusted	1.81 (1.30–2.52)	<.001	1.85 (1.31–2.61)	<.001	1.92 (1.36–2.70)	<.001	1.77 (1.26–2.48)	<.001
Adjusted	0.89 (0.55–1.44)	.638	1.09 (0.68–1.74)	.720	1.35 (0.86–2.14)	.197	1.29 (0.82–2.04)	.269
Obstructed defecation								
Unadjusted	1.10 (0.82–1.47)	.540	0.89 (0.65–1.22)	.479	1.29 (0.94–1.76)	.112	1.37 (1.00–1.87)	.047
Adjusted	0.88 (0.58–1.35)	.559	0.81 (0.53–1.24)	.337	0.81 (0.54–1.23)	.323	0.92 (0.61–1.38)	.674
Fecal incontinence								
Unadjusted	1.34 (1.01–1.76)	.040	0.96 (0.71–1.28)	.770	1.48 (1.11–1.99)	.008	1.68 (1.25–2.26)	<.001
Adjusted	1.21 (0.80–1.84)	.361	0.77 (0.51–1.16)	.216	0.84 (0.56–1.24)	.376	1.02 (0.69–1.52)	.919

PFD = pelvic floor dysfunction; PFDI = Pelvic Floor Distress Inventory; PFIQ = Pelvic Floor Impact Questionnaire; POP = pelvic organ prolapse; UI = urinary incontinence.

There are numerous reports to support the premise that treatment of PFD improves sexual function.[27–29] This might seem contrary to our findings that sexual dysfunction in women with PFD is not directly attributable to PFD. However, the anatomic improvement provided by surgical repair could positively affect the psychological and emotional determinants of female sexual function. We do not believe that our findings should modify informed discussions with patients about expectations of functional outcomes from surgery for PFD. Unfortunately, with the exception of multiple pelvic floor disorders, we did not identify any parameters predictive of patients amenable to obliterative surgery for PFD.

Strengths of our study are the large sample with a wide spectrum of age, sexual activity, sexual enjoyment, and sexual function and the ability to analyze the influence of known determinants of sexual dysfunction. Use of the SPEQ allowed us to correct for these independent determinants of sexual dysfunction in investigating the role of PFD.

Weaknesses of our study are the lack of a control group without PFD and lack of a measurement for sexual distress. A recent multicenter study compared women with PFD with a cohort of women presenting for general gynecologic concerns. Direct comparison using the Female Sexual Function Index showed no difference in sexual activity or functional domains (data not shown), supporting our findings that PFD does not independently affect sexual function.[26] The only exception for the comparison was the domain of desire, which was lower in the PFD cohort.[26]

This supports the hypothesis that a negative body image might be associated with PFD and could account for the higher rates of sexual difficulty seen in this population of women. Future studies should investigate associations between PFD and sexual dysfunction corrected for body image.

Overall, we found higher rates of sexual difficulties related to desire, arousal, and orgasm in a cross-section of women with PFD; however, this relation might be entirely explained by factors unrelated to the pelvic floor.

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