

ORIGINAL RESEARCH—PAIN

Prevalence and Predictors of Genito-Pelvic Pain in Pregnancy and Postpartum: The Prospective Impact of Fear Avoidance

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ABSTRACT

Introduction. There is limited knowledge regarding the symptom profile of genito-pelvic pain in pregnancy and postpartum, and potential psychosocial predictors of this pain. Prior studies have reported a positive association between prepregnancy pain and postpartum genito-pelvic pain. Greater fear avoidance has been associated with increased genital pain intensity in women, unrelated to childbirth. This relationship has not been examined prospectively in a postpartum population.

Aims. The study aims were to examine the symptom profile of genito-pelvic pain during pregnancy and at 3 months postpartum, and the impact of prepregnancy nongenito-pelvic pain and fear avoidance in pregnancy on genito-pelvic pain at 3 months postpartum.

Methods. First-time expectant mothers (N = 150) completed measures of fear avoidance (pain-related anxiety, catastrophizing, hypervigilance to pain), prepregnancy nongenito-pelvic pain, childbirth-related risk factors (e.g., episiotomy), and breastfeeding.

Main Outcome Measures. Those reporting genito-pelvic pain in pregnancy and/or at 3 months postpartum answered questions about the onset (pregnancy, during pregnancy, postpartum) and location (genital, pelvic, or both) of the pain and rated the intensity and unpleasantness of the pain on numerical rating scales.

Results. Of 150 women, 49% reported genito-pelvic pain in pregnancy. The pain resolved for 59% of women, persisted for 41%, and 7% of women reported a new onset of genito-pelvic pain after childbirth. Prepregnancy nongenito-pelvic pain was associated with an increased likelihood of postpartum onset of genito-pelvic pain. Greater pain-related anxiety was associated with greater average genito-pelvic pain intensity at 3 months postpartum.

Conclusions. Results suggest that about half of women may develop genito-pelvic pain during pregnancy, which will persist for about a third, and a subset will develop this pain after childbirth. Prior recurrent nongenito-pelvic pain may enhance the risk of developing genito-pelvic pain postpartum, while greater pain-related anxiety in pregnancy may increase the risk for greater intensity of postpartum genito-pelvic pain. **Glowacka M, Rosen N, Chorney J, Snelgrove-Clarke E, and George RB. Prevalence and predictors of genito-pelvic pain in pregnancy and postpartum: The prospective impact of fear avoidance. J Sex Med 2014;11:3021–3034.**

Key Words. Postpartum Pain; Fear Avoidance; Pain-Related Anxiety; Catastrophizing; Hypervigilance to Pain; Genito-Pelvic Pain; Dyspareunia; Childbirth

Introduction

Genital and pelvic (genito-pelvic) pain, often causing pain during sexual intercourse, can severely impact the quality of life and psychological and sexual adjustment of affected women and their families [1–3]. For some women, there are no relevant physical findings [4]. For others, genito-pelvic pain can result from underlying physical pathologies or psychosocial factors [1,4–6] or as a result of a particular event, such as pregnancy and childbirth [7,8]. The prevalence of genito-pelvic pain in pregnancy is estimated to be 22% [9]. The majority of women resume regular intercourse by 3 months postpartum, and the prevalence of women experiencing it is as painful is approximately 30% [10]; however, prevalence rates have been reported to be as high as 62% [7]. Estimates of this pain are limited by low response rates, retrospective and cross-sectional study designs, varying measures of pain intensity, and a failure to report or control for whether the onset of genito-pelvic pain predated childbirth [8].

Women with genito-pelvic pain report disruptions to their sexual and psychological functioning, including lower sexual satisfaction, desire, and sexual self-esteem, as well as greater anxiety than women without this pain [11]. Women who experience this pain postpartum may encounter additional pain-related consequences than women who have genito-pelvic pain that is not related to childbirth. Specifically, acute genito-pelvic pain may limit the recovery and function of women in the postpartum period and is a risk factor for developing chronic genito-pelvic pain problems [12] and postpartum depression [13]. First-time mothers may be particularly at risk for difficulties coping with the pain and maintaining intimacy in their relationships because they are already coping with novel stressors (e.g., sleep deprivation, role transitions) [14]. Given the potentially high prevalence of this condition, it is important to understand the symptom profile (i.e., onset, location) and predictors of genito-pelvic pain in pregnancy and postpartum to improve interventions for affected women. Thus, the aims of the current study are (i) to examine the symptom profile of genito-pelvic pain during pregnancy and at 3 months postpartum and (ii) to determine the impact of biomedical and psychosocial factors on genito-pelvic pain at 3 months postpartum.

Genito-Pelvic Pain Related to Childbirth

Paterson and colleagues conducted a retrospective study of 114 women to examine the symptom profile of genito-pelvic pain at 12 months postpartum. The majority of women who reported genito-pelvic pain recalled that the pain developed postpartum, whereas less than one-third of these women reported that the onset was during pregnancy. In those with a postpartum onset, the pain was located only in the genital area in most women. However, during pregnancy, women reported the location of pain in the genital region, pelvic region, and in both regions. This study was limited by a small sample of women with postpartum onset of pain that persisted to 12 months postpartum ($n = 10$) and a cross-sectional, retrospective design [8]. There is a lack of knowledge regarding the trajectory of genito-pelvic pain from pregnancy to postpartum. Increased knowledge of pain profiles and their predictors is important in order to identify key time points for interventions targeting genito-pelvic pain. Further, identifying differences in the location of genito-pelvic pain could help health care providers determine what recommendations are most appropriate for reducing the pain and associated disability.

Genito-pelvic pain after childbirth may be experienced for a variety of reasons, with biomedical factors having received the most empirical attention. Having a diagnosed chronic pain condition (e.g., migraine headaches, back pain), suffering from acute pain, and experiencing pain during sexual intercourse prior to childbirth have been found to increase the risk of postpartum genito-pelvic pain [7,8,15,16]. Studies of women with chronic genital pain conditions unrelated to childbirth suggest central sensitization may explain the link between prior pain conditions and subsequent genital pain [4]. Tears to the perineum, episiotomy, and assisted delivery (use of forceps or an obstetric vacuum) during childbirth have also been found to increase the risk of postpartum genito-pelvic pain, possibly due to perineal trauma [17–19]. Results regarding mode of delivery are mixed with some studies finding that vaginal delivery (vs. cesarean) increased the risk of genito-pelvic pain at 3 months postpartum [7,20], and others did not find this association [8,12]. Breastfeeding has been associated with this pain at 3 months postpartum [10], although studies have failed to find this association at a longer-term follow-up [8,21]. These inconsistent

findings suggest that further examination of childbirth factors in the development of postpartum genito-pelvic pain is warranted.

In summary of the biomedical factors, the development and intensity of postpartum genito-pelvic pain could be related to events that predate pregnancy (i.e., prior pain conditions), events that are related to labor and delivery (i.e., childbirth risk factors), and/or events following childbirth (i.e., breastfeeding). Prior studies have focused solely on biomedical factors and have failed to integrate psychosocial factors [17,18,22], which are known to play an important role in the development and maintenance of genito-pelvic pain [11,23].

Fear Avoidance Model of Pain

Relative to biomedical factors, the role of psychosocial factors in the development and maintenance of postpartum genito-pelvic pain has been understudied. According to the fear avoidance model [24], an individual who experiences pain may interpret it as threatening (catastrophizing), which leads to greater fear of pain, anxiety, and hypervigilance. The person then avoids the pain-inducing experience, further exacerbating the interpretation of pain as threatening and strengthening the cycle of fear avoidance [25]. The fear avoidance model has been well established in chronic pain populations [26,27], including studies of women with genito-pelvic pain unrelated to childbirth [28–33]. However, there were several limitations to this prior research. First, women were asked to recall their genito-pelvic pain in the past, which increased the risk of recall bias. Second, women were previously diagnosed with a genito-pelvic pain condition, and thus, the authors could not control for prior levels of pain. Third, most studies were cross sectional; thus, the researchers could not gain insight into how psychosocial variables led to the development and severity of genito-pelvic pain. Finally, no studies examined the role of fear avoidance in postpartum genito-pelvic pain.

The current study addressed the limitations of prior research and also added novel data to the literature through a comprehensive investigation of biopsychosocial predictors of postpartum genito-pelvic pain. The first objective of this study was to describe the self-reported prevalence, onset, and location of genito-pelvic pain at 30–36 weeks gestation and at 3 months postpartum. Women were assessed at 30–36 weeks gestation because women are likely to experience some pain

at this point [34]; thus, this may be an optimal time to capture pain cognitions. Assessing fear avoidance may be important even among women who do not experience pain during pregnancy. Previous research has shown that individuals who are pain free may harbor fear avoidance beliefs that become activated during a pain experience and result in greater pain [35]. A 3-month postpartum follow-up was selected because approximately 80% of women resume sexual intercourse by this time despite a potentially high prevalence of genito-pelvic pain [7,10,36]. Further, acute pain is a risk factor for developing chronic pain [12]; thus, 3 months postpartum may be a critical time for intervention.

The second objective of the current study was to examine the prospective impact of self-reported biopsychosocial factors in pregnancy including biomedical factors (i.e., childbirth-related risk factors, prior nongenito-pelvic pain, and breastfeeding), as well as catastrophizing, pain-related anxiety (including fear of pain, anxiety, and avoidance), and hypervigilance to pain on genito-pelvic pain at 3 months postpartum. No specific hypotheses were made about childbirth risk factors (vaginal delivery assisted with forceps/vacuum, episiotomy, vaginal/perineal tear, and epidural) and breastfeeding due to inconsistent prior findings. It was hypothesized that, controlling for relevant biomedical factors, prepregnancy nongenito-pelvic pain and greater fear avoidance during pregnancy would be associated with greater postpartum genito-pelvic pain intensity and unpleasantness at 3 months postpartum.

Methods

Participants

Women were recruited from a perinatal clinic at a large urban hospital. Prior to recruitment, charts of all women with appointments at the clinic were screened for inclusion criteria. To be eligible for the study, women had to be first-time mothers at 30–36 weeks gestation, pregnant with a single child, and have no indication of a complicated pregnancy. Women must have also had access to a personal email account.

Procedure

All women who were eligible for the study after the chart review were approached in the clinic by a research assistant and engaged in informed consent. Women who consented to participate

were asked to complete online measures of sociodemographics, hypervigilance to pain, pain-related anxiety, catastrophizing, nongenito-pelvic pain experience pre-pregnancy, and the presence, average intensity, and unpleasantness of genito-pelvic pain using an iPad tablet in the clinic or at home if they preferred (via an emailed link to the survey). If women began the survey in the clinic but did not finish, then a link containing their partially completed survey was emailed to them. Women received a reminder phone call and email 2 days after they entered the study and an email once a week for 2 weeks thereafter. At 2 weeks postpartum, women were emailed a link to a brief survey with questions related to their childbirth experience (e.g., mode of delivery). At 3 months postpartum, women were emailed a link to the follow-up survey containing measures of genito-pelvic pain. The same protocol for reminders was used for all time points. At each time point, women had the opportunity to enter their name for a draw to win an iPad in appreciation of their participation. The study protocol was approved by the institutional research ethics board.

Measures

Sociodemographics and Prior Pain Experience

Participants completed questions about their age, level of education, nationality, and relationship status. Women also responded to a question about whether or not they experienced nongenito-pelvic pain more than once per week or more than five times per month prior to pregnancy, representing the presence of prior recurrent pain [37].

Childbirth Factors and Breastfeeding

Women reported on mode of delivery (vaginal vs. caesarean) and replied “yes” or “no” to questions about the interventions used during labor and delivery (episiotomy, vacuum, or forceps delivery) and tearing in the vagina or perineum during childbirth. Women also reported on whether or not they were breastfeeding at 2 weeks postpartum and at 3 months postpartum.

Hypervigilance to Pain

The Pain Vigilance and Awareness Questionnaire [38] was used to assess hypervigilance to pain. This measure gauges the excessive tendency to attend to pain. It contains 16 items that are rated from 1 (*never*) to 5 (*always*) based on how much each item applies to the individual’s pain experience. Higher scores reflect greater hypervigilance. Studies have

found good test–retest reliability, internal consistency, and construct validity for this measure in chronic pain populations [38,39] and in a genital pain population [28]. Internal consistency was excellent for the current study (Cronbach’s $\alpha = 0.91$).

Pain-Related Anxiety

The Pain Anxiety Symptoms Scale (PASS-20) [40] was used to assess pain-related anxiety including fear of pain, cognitive anxiety responses, physiological anxiety responses, and escape and avoidance. It consists of 20 items rated on a scale from 0 (*never*) to 5 (*always*). Higher scores indicate greater endorsement of pain-related anxiety. The PASS-20 has shown good internal consistency, test–retest reliability, and a stable factorial structure in pain populations [40], including genital pain [28]. Results showed an excellent internal consistency in the current sample (Cronbach $\alpha = 0.92$).

Pain Catastrophizing

Pain catastrophizing was assessed with the Pain Catastrophizing Scale (PCS) [41]. The PCS measures exaggerated negative thoughts and feelings about pain via three subscales: rumination, magnification, and helplessness. The PCS contains 13 items rated on a scale from 0 (*not at all*) to 4 (*all the time*). Higher scores indicate higher catastrophizing about pain. The PCS has been shown to have high internal consistency, construct validity, predictive validity, and test–retest reliability in chronic pain populations [38,41] and in genital pain [28]. It has a stable factorial structure and correlates with pain and disability measures in various chronic pain populations [41]. Results showed an excellent internal consistency (Cronbach $\alpha = 0.94$).

Presence, Onset, and Location of Genito-Pelvic Pain

Women were asked (yes/no) whether they experienced genito-pelvic pain in the past 4 weeks (during pregnancy) and in the past 2 weeks (at 3 months postpartum). Women were subsequently categorized into four genito-pelvic pain onset groups: (i) those who reported no pain at either time point were categorized into the “no pain” group; (ii) those who reported pain in pregnancy that resolved by postpartum were placed in the “resolved pain” group; (iii) those who had pain in pregnancy that persisted to postpartum were put

in the “persistent pain” group; and (iv) women who did not have genito-pelvic pain in pregnancy but reported the pain at 3 months postpartum were identified as the “postpartum onset” pain group. Women who reported genito-pelvic pain in pregnancy or in postpartum were asked when the pain began and whether it was provoked or unprovoked pain. Women also reported whether the pain was located in the genital region (i.e., on the vulva, at the vaginal opening, inside the vagina, or on the perineum), pelvic region, or both.

Average Genito-Pelvic Pain Intensity

Average genito-pelvic pain intensity in the preceding 2 weeks was assessed using a numeric rating scale from 0 (*no pain*) to 10 (*worst pain ever*). This scale has been reliably used to measure various types of chronic and acute pain, including genital pain [29,42,43] and postpartum genito-pelvic pain [8]. It is positively correlated with other measures of pain intensity [28] and has been found to be sensitive to treatment effects in women with genital pain [44].

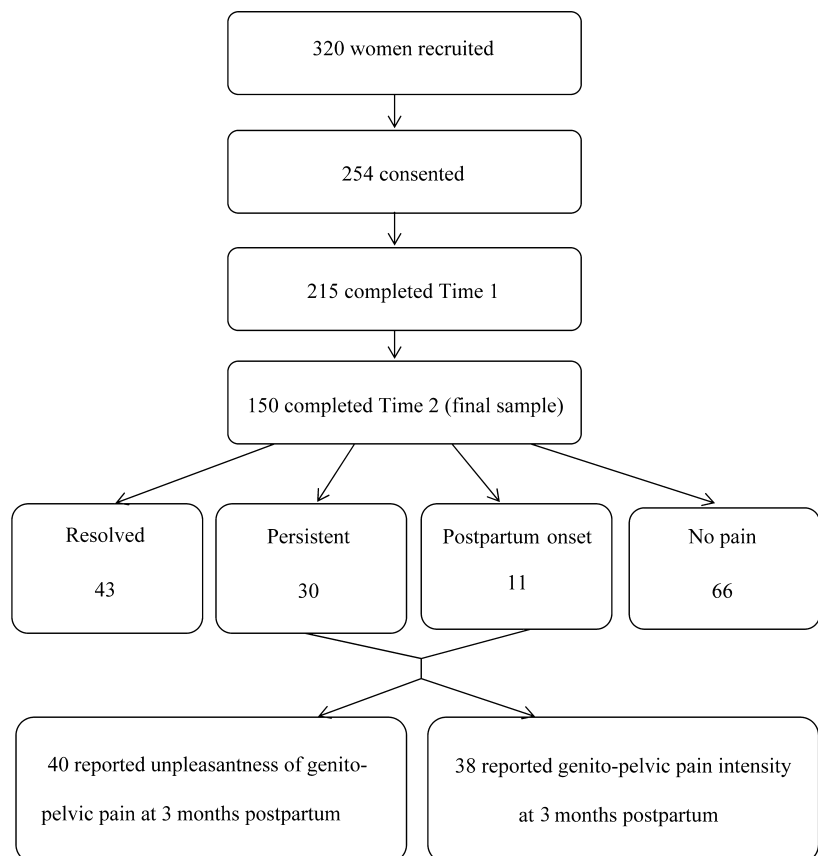
Unpleasantness of Genito-Pelvic Pain

The average unpleasantness of genito-pelvic pain in the preceding 2 weeks was assessed using a numeric rating scale from 0 (*not unpleasant*) to 10 (*most unpleasant ever*). This scale has been used to assess unpleasantness of pain in women with genital [32] and pelvic pain [45], as well as in women who reported genito-pelvic pain postpartum [8]. In a previous study, this measure was correlated with pain intensity measures used to assess postpartum genito-pelvic pain [8].

Results

Figure 1 illustrates the flow of recruitment through participation in the study. A total of 320 women were invited to participate, and only women who completed Time 1 were sent the survey at 3 months postpartum (Time 2). Women who completed both Time 1 and Time 2 (N = 150) were included in the analyses. Participants did not differ from those who only completed Time 1 with respect to average genito-pelvic pain intensity, unpleasantness of

Figure 1 Flowchart of the number of women recruited, participated at each time point, and belonging to each genito-pelvic pain group: resolved, genito-pelvic pain during pregnancy that resolved by 3 months postpartum; persistent, genito-pelvic pain present during pregnancy and at 3 months postpartum; postpartum onset, genito-pelvic pain that was not present during pregnancy and was present at 3 months postpartum; no pain, no genito-pelvic pain reported in pregnancy or postpartum



genito-pelvic pain, and the presence of nongenito-pelvic pain pre-pregnancy, pain-related anxiety, catastrophizing, and hypervigilance to pain. There were significantly fewer women with a graduate degree than expected in the group of women who did not complete both time points ($\chi^2 [4] = 13.20$, $P = 0.01$); however, there were no other differences in sociodemographic characteristics.

Participant Characteristics

Descriptive statistics for the sample are shown in Table 1. The mean age of women was 29.95 (standard deviation [SD] = 5.41) during pregnancy. The majority of participants were Canadian, married, and held a postsecondary degree. Nineteen percent (28/149) of the women reported experiencing nongenito-pelvic pain more than once per week or more than five times per month prior to pregnancy. Among these 28 women, 68% had back pain, 29% had hip pain, 29% had leg pain, 32% had foot pain, 21% had headaches, and 39% reported other pain. Twenty-three women indicated pain in more than one location.

Ninety-two percent (138/150) of women completed the survey at 2 weeks postpartum. Of these women, 49% had an unassisted vaginal delivery, 15% had an assisted vaginal delivery (forceps or vacuum extraction), and 36% had a caesarean delivery. Of those who delivered vaginally, 27% had an episiotomy and 76% reported a vaginal or perineal tear. Eighty-one percent of the women received an epidural during labor. Eighty-three percent reported breastfeeding at 2 weeks postpartum, and 70% were still breastfeeding at 3 months.

Genito-Pelvic Pain in Pregnancy and 3 Months Postpartum

Presence, Location, and Onset of Genito-Pelvic Pain

Of the women in the final sample, 49% (73/150) reported experiencing genito-pelvic pain during pregnancy. Eighty-nine percent (65/73) of these women reported that the pain developed during pregnancy, 7% (5/73) indicated that the pain developed prior to pregnancy, and 4% (3/73) did not report when the pain developed. The mean

Table 1 Descriptive statistics for the sample

Characteristic	M (range) or N	SD	%
Age (years; n = 149)	29.95 (19–42)	5.41	
Education level (n = 150)			
High school or equivalent	24		16
Postsecondary degree	126		84
Nationality (n = 150)			
Canadian	130		87
Other	20		13
Relationship status (n = 150)			
Married	94		63
Cohabiting with partner	49		33
Dating one partner	5		3
Separated/divorced	1		0*
No partner	1		0*
Mode of delivery (n = 136)			
Caesarean delivery	49		36
Assisted vaginal delivery	21		15
Unassisted vaginal delivery	66		49
Episiotomy (n = 88)	24		27
Vaginal/perineal tear (n = 88)	67		76
Epidural (n = 135)	109		81
Breastfeeding 2 weeks postpartum (n = 137)	114		83
Breastfeeding 3 weeks postpartum (n = 147)	103		70
Nongenito-pelvic pain pre-pregnancy (n = 149)	28		19
Postpartum genito-pelvic pain (n = 41)			
Hypervigilance to pain (n = 41)	45.49 (28–72)	10.52	
Pain-related anxiety (n = 41)	34.80 (9–75)	17.38	
Pain catastrophizing (n = 41)	14.54 (1–38)	10.22	
Average genito-pelvic pain intensity (n = 38)	2.45 (0–8)	2.08	
Unpleasantness of genito-pelvic pain (n = 40)	3.25 (0–9)	2.46	

*Value is less than 0.05.

Analyses were based on number of women who completed each question.
SD = standard deviation

Table 2 Pain location based on genito-pelvic pain group

Prevalence and pain location	Resolved pain Pregnancy (%)	Persistent pain		Postpartum onset pain Postpartum (%)
		Pregnancy (%)	Postpartum (%)	
Prevalence (n and % of sample = 150)	43 (29)	30 (20)	30 (20)	11 (7)
Type (n and % of group)				
Genital pain only	11 (26)	8 (27)	14 (47)	4 (36)
Pelvic pain only	12 (28)	5 (17)	4 (13)	4 (36)
Both genital and pelvic	16 (37)	14 (47)	12 (40)	1 (9)
Not specified	4 (9)	3 (10)	0 (0)	2 (18)

Resolved pain, genito-pelvic pain during pregnancy that resolved by 3 months postpartum; persistent pain, genito-pelvic pain present during pregnancy and at 3 months postpartum; postpartum onset pain, genito-pelvic pain that was not present during pregnancy and was present at 3 months postpartum. Pain location in pregnancy was reported at 30–36 weeks gestation; pain location in the postpartum period was reported at 3 months postpartum.

length of time for experiencing genito-pelvic pain in pregnancy was 5.76 weeks (range 0–84; SD = 15.33). At 3 months postpartum, women had been experiencing genito-pelvic pain on average for 7.6 weeks (range 1–84; SD = 17.51). In pregnancy, 44% (32/72) of women reported that the genito-pelvic pain they experienced was unprovoked. In contrast, only 23% (9/39) of women indicated that their genito-pelvic pain was unprovoked at 3 months postpartum.

Of those in the final sample, 29% (43/150) reported genito-pelvic pain during pregnancy that resolved by 3 months postpartum (resolved pain). Twenty-seven percent (41/150) reported experiencing genito-pelvic pain at 3 months postpartum, and of these women, 73% (30/41) indicated that their genito-pelvic pain during pregnancy persisted from pregnancy to 3 months postpartum (persistent pain). Further, 27% (11/41) did not experience genito-pelvic pain during pregnancy but reported experiencing this pain at 3 months postpartum (postpartum onset pain). Forty-four percent (66/150) of women reported no genito-pelvic pain in pregnancy or at 3 months postpartum (no pain).

The location of genito-pelvic pain during pregnancy and at 3 months postpartum is reported in Table 2. In the resolved pain group, 26% (11/43) reported only genital pain, 28% (12/43) reported only pelvic pain, 37% (16/43) indicated both genital and pelvic pain, and 9% (4/43) did not specify the pain location in pregnancy. Of those who reported genital pain in pregnancy that resolved by postpartum, 22% (6/27) experienced the pain on the vulva, 15% (4/27) at the vaginal opening, 30% (8/27) inside the vagina, 11% (3/27) on the perineum, and 22% (6/27) reported two or more vaginal pain locations.

With regard to the persistent pain group, during pregnancy, 27% (8/30) indicated experiencing only genital pain, 17% (5/30) reported

only pelvic pain, 50% (15/30) indicated both genital and pelvic pain, and 7% (2/30) did not specify the pain location. More specifically, for those reporting genital pain during pregnancy, 13% (3/23) had pain at the vaginal opening, 26% (6/23) inside the vagina, and the majority (61%; 14/23) reported more than one genital pain location. At 3 months postpartum, 47% (14/30) of the women in the persistent pain group experienced only genital pain, 13% (4/30) reported only pelvic pain, and 40% (12/30) reported both. For those reporting genital pain at 3 months postpartum, 4% (1/26) indicated pain on the vulva, 12% (3/26) at the vaginal opening, 23% (6/26) inside the vagina, 4% (1/26) on the perineum, and most (58%; 15/26) had genital pain in more than one location. Of the women in the persistent pain group, 57% (17/30) reported the same pain location in pregnancy and postpartum, whereas the remaining women reported changes in pain location (e.g., both genito-pelvic in pregnancy, genital only at postpartum).

Finally, in the postpartum onset pain group, 36% (4/11) reported only genital pain, 36% (4/11) reported only pelvic pain, 9% (1/11) reported both genital and pelvic pain, and 18% (2/11) did not indicate the location of the pain in postpartum. Among those who reported genital pain, 20% (1/5) reported pain at the vaginal opening, 40% (2/5) experienced pain inside the vagina, and 40% (2/5) indicated more than one genital pain location.

Intercorrelations

Table 3 reports the correlations between measures of genito-pelvic pain at 3 months postpartum (intensity and unpleasantness) and genito-pelvic pain onset group in pregnancy and postpartum and the other study variables including socio-demographic characteristics, childbirth factors,

Table 3 Standardized correlation coefficients of genito-pelvic pain measures and psychological functioning

Characteristic	Genito-pelvic pain intensity at 3 months postpartum (n = 38)	Unpleasantness of genito-pelvic pain at 3 months postpartum (n = 41)	Genito-pelvic pain group from pregnancy and postpartum (n = 150)
Age (years)	-0.04	-0.18	0.10
Education level	-0.05	0.04	0.05
Nationality	0.37*	0.52**	0.03
Relationship status	-0.00	0.05	-0.07
Mode of delivery	-0.19	0.03	0.01
Episiotomy	-0.08	-0.18	-0.16
Vaginal/perineum tear	-0.25	-0.01	0.05
Epidural	-0.28	-0.22	-0.06
Breastfeeding 2 weeks (post)	0.27	0.23	0.01
Breastfeeding 3 months (post)	0.14	0.09	0.03
Nongenito-pelvic pain pre-pregnancy	0.06	0.05	0.19*
Hypervigilance to pain	0.44**	0.42**	0.04
Pain-related anxiety	0.56***	0.50**	-0.07
Pain catastrophizing	0.35*	0.33*	-0.19

* $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$

Genito-pelvic pain group consisted of the following groups: resolved pain, genito-pelvic pain during pregnancy that resolved by 3 months postpartum; persistent pain, genito-pelvic pain present during pregnancy and at 3 months postpartum; postpartum onset pain, genito-pelvic pain that was not present during pregnancy and was present at 3 months postpartum.

breastfeeding, presence of nongenito-pelvic pain pre-pregnancy, pain-related anxiety, hypervigilance to pain, and catastrophizing in pregnancy. Being of a nationality other than Canadian was associated with greater average postpartum genito-pelvic pain intensity and unpleasantness. No other sociodemographic characteristics were significantly associated with the genito-pelvic pain measures. Childbirth factors (mode of delivery, episiotomy, epidural, and vaginal/perineal tear) and breastfeeding were not associated with the genito-pelvic pain intensity and unpleasantness or with genito-pelvic pain onset group at 3 months postpartum. However, the presence of nongenito-pelvic pain prior to pregnancy was associated with genito-pelvic pain onset group. Greater hypervigilance to pain, pain-related anxiety, and catastrophizing were related to higher average genito-pelvic pain intensity and unpleasantness.

Hypervigilance to pain was moderately correlated with pain-related anxiety ($r = 0.62$, $P < 0.001$) and pain catastrophizing ($r = 0.51$, $P < 0.001$) in pregnancy. Pain catastrophizing was strongly correlated with pain-related anxiety ($r = 0.78$, $P < 0.001$) in pregnancy. Consequently, pain-related anxiety and catastrophizing could not be included together in the regression analyses due to multicollinearity. In order to examine whether pain-related anxiety or catastrophizing contributed to pain outcomes, separate regression analyses were conducted with each variable as a predictor along with the third predictor, hypervigilance to pain.

Correlates of Postpartum Genito-Pelvic Pain

To examine the second objective, which was to determine the impact of nongenito-pelvic pain pre-pregnancy, pain-related anxiety, catastrophizing, and hypervigilance to pain during pregnancy on the average intensity and unpleasantness of genito-pelvic pain at 3 months postpartum, multiple linear regression analyses were conducted (Table 4). The analyses for average genito-pelvic pain intensity (n = 38) and unpleasantness of genito-pelvic pain (n = 40) included only those women who reported genito-pelvic pain at 3 months postpartum. Consistent with the hypothesis, controlling for nationality, higher pain-related anxiety, and hypervigilance to pain during pregnancy accounted for 35% and 40% of the variance in the average genito-pelvic pain intensity, $F(3, 35) = 6.23$, $P = 0.002$, and unpleasantness, $F(3, 37) = 8.10$, $P < 0.001$, of genito-pelvic pain in women with persistent or postpartum onset pain at 3 months postpartum. Pain-related anxiety was an independent predictor of average postpartum genito-pelvic pain intensity ($\beta = 0.47$, $P = 0.03$); therefore, greater pain-related anxiety in pregnancy was associated with more intense genito-pelvic pain at 3 months postpartum. Nationality was an independent predictor of the unpleasantness of genito-pelvic pain intensity ($\beta = 0.40$, $P = 0.007$), and there was a trend for pain-related anxiety as a unique predictor in this relationship ($\beta = 0.35$, $P = 0.06$). Being of a nationality other than Canadian and greater pain-related anxiety

Table 4 Results of multiple linear regression analyses for pain-related anxiety, hypervigilance to pain, and catastrophizing predicting average pain intensity and unpleasantness of genito-pelvic pain

Variables	B	SE B	β
Pain-related anxiety and hypervigilance to pain as predictors			
Average genito-pelvic pain intensity (n = 38)			
Pain-related anxiety	0.06	0.02	0.47*
Hypervigilance to pain	0.00†	0.04	0.02
Unpleasantness of genito-pelvic pain (n = 41)			
Pain-related anxiety	0.05	0.03	0.35
Hypervigilance to pain	0.01	0.04	0.03
Catastrophizing and hypervigilance to pain as predictors			
Average genito-pelvic pain intensity (n = 38)			
Catastrophizing	0.02	0.04	0.09
Hypervigilance to pain	0.06	0.04	0.29
Unpleasantness of genito-pelvic pain (n = 41)			
Catastrophizing	0.02	0.04	0.06
Hypervigilance to pain	0.05	0.04	0.23

* $P \leq 0.05$

†Value is less than 0.005.

Pain-related anxiety and hypervigilance to pain as predictors: $R^2 = 0.35$ for average genito-pelvic pain intensity; $R^2 = 0.40$ for unpleasantness of genito-pelvic pain. Catastrophizing and hypervigilance to pain as predictors: $R^2 = 0.25$ for average genito-pelvic pain intensity; $R^2 = 0.34$ for unpleasantness of genito-pelvic pain. SE = standard error

were associated with more unpleasantness of genito-pelvic pain. Controlling for nationality, higher pain catastrophizing and hypervigilance to pain accounted for 25% and 34% of the variance in the average genito-pelvic pain intensity, $F(3, 34) = 3.72$, $P = 0.02$, and unpleasantness, $F(3, 36) = 6.10$, $P = 0.002$, of genito-pelvic pain at 3 months postpartum; however, neither catastrophizing or hypervigilance was a unique predictor. Only nationality independently predicted the unpleasantness of the pain ($\beta = 0.42$, $P = 0.01$).

Analyses regarding genito-pelvic pain onset group (no pain, resolved, persistent, or postpartum onset) included the entire sample ($N = 150$). A chi-squared test of independence showed that the relation between genito-pelvic pain onset group and the presence of nongenito-pelvic pain prior to pregnancy was significant, $\chi^2(3) = 11.72$, $P < 0.01$. There were more women in the postpartum onset genito-pelvic pain group than expected ($P < 0.05$), indicating that reporting recurrent nongenito-pelvic pain pre-pregnancy increased the likelihood of experiencing postpartum onset of genito-pelvic pain. Reporting a pre-pregnancy nongenito-pelvic pain condition did not significantly differentiate the remaining genito-pelvic pain onset groups nor did pain-related anxiety, catastrophizing, or hypervigilance.

Discussion

This study aimed to describe genito-pelvic pain in pregnancy and postpartum and identify

biopsychosocial predictors of this pain at 3 months postpartum. In the current sample, 49% of women reported genito-pelvic pain in pregnancy, which resolved by 3 months postpartum for 59% and persisted for 41%. Only 7% of the entire sample reported a postpartum onset of genito-pelvic pain. Results also indicated that the presence of recurrent pre-pregnancy nongenito-pelvic pain was associated with an increased likelihood of postpartum onset pain. Finally, greater pain-related anxiety (i.e., fear of pain, anxiety, and avoidance) during pregnancy was associated with more intense genito-pelvic pain at 3 months postpartum.

The first objective of this study was to examine the self-reported prevalence, onset, and location of genito-pelvic pain in late pregnancy and at 3 months postpartum. Approximately half of women developed genito-pelvic pain during pregnancy, but this pain resolved for a majority, persisted for about a third, and some women newly developed this pain postpartum. This prevalence of genito-pelvic pain in pregnancy is consistent with previous estimates [46,47]. The majority of women who reported postpartum genito-pelvic pain indicated that the pain developed during their pregnancy. Most prior studies of genito-pelvic pain have been retrospective, focused on the postpartum period, and have not reported the onset of the pain [7,15,36,48]. That only 7% of our sample reported the onset of this pain after childbirth suggests that previous reports of postpartum onset genito-pelvic pain may be overestimates (30–62%) [7,10]. Still, given how common childbirth is worldwide, this

pain may affect an enormous number of women, at least in the short term.

Regarding the location of genito-pelvic pain, there was a great variation across the genito-pelvic pain onset groups. The heterogeneity of pain locations suggests that health care providers should ask about the location of the pain to help guide interventions for alleviating pain. For example, women and couples could be encouraged to experiment with nonpenetrative sexual activity or different positions that may be less painful. Future research should examine genito-pelvic pain at different phases of pregnancy and several years postpartum to examine how the presence and location of this pain changes over time and may progress into chronic pain.

Improved knowledge regarding genito-pelvic pain is important for helping health care providers inform women that this is not just a postpartum problem and that genito-pelvic pain could be present in pregnancy as well. Women may find it reassuring to know that this pain is common in pregnancy but that it resolves for many. Such information could lead women to have more accurate expectations about this pain, which could help them to develop more adaptive coping strategies. Increased use of coping strategies has been found to reduce pain intensity in chronic pain patients and in women with localized genital pain [29,49].

The second objective of this study was to examine self-reported biopsychosocial predictors of postpartum genito-pelvic pain. With regard to biomedical predictors, childbirth factors (mode of delivery, episiotomy, vaginal/perineal tear, and epidural) and breastfeeding were not associated with the genito-pelvic pain onset group, pain intensity, or unpleasantness of genito-pelvic pain at 3 months postpartum. This finding contradicts previous research that found that assisted vaginal delivery, episiotomy, vaginal/perineal tear, epidural, and breastfeeding were related to the presence of postpartum genito-pelvic pain and to greater intensity of the pain [10,17,18,22]. It has been proposed that childbirth factors were associated with a greater risk of perineal trauma, thus leading to prolonged genito-pelvic pain [50]. However, studies have found that women with no perineal trauma also report genito-pelvic pain after childbirth [20]. Similarly, two cross-sectional studies and a prospective study of genito-pelvic pain found that the mode of delivery was not associated with developing postpartum pain [7,8,12]. Some studies have reported an association between breastfeeding and greater genito-pelvic

pain [7,10,51], proposing that hormonal changes associated with lactation lead to a loss of libido and an increase in vaginal dryness resulting in greater genito-pelvic pain [50,52]. However, two studies found that breastfeeding was not associated with genito-pelvic pain [8,21]. The current results support prior research suggesting that childbirth risk factors and breastfeeding may not contribute to postpartum genito-pelvic pain.

Recurrent, nongenito-pelvic pain prior to pregnancy was found to be associated with an increased likelihood of a postpartum onset of genito-pelvic pain. Prior studies have reported a positive link between prepregnancy pain (e.g., back pain) and postpartum genito-pelvic pain [7,8,15,16]. It is thought that the underlying mechanisms of this association may be central and peripheral sensitization. Repeated experiences with pain may increase sensitization to pain in the brain and spinal cord, resulting in a lowered overall pain threshold. Prior pain may also lead to pain in other locations via a lowered nociceptor threshold (i.e., in the vestibular mucosa) and increased peripheral sensitization (i.e., increased activation of the central nervous system) [4]. In support of this theory, women with chronic genital pain tend to express lower pain thresholds, increased pain perception, and more activation in areas of the brain involved in pain modulation [4]. The results of the current study highlight the importance of health care providers asking women about previous pain problems. Women with prepregnancy pain should be informed of the possibility of genito-pelvic pain in pregnancy and after childbirth and urged to develop or use coping strategies.

Another aim of this study was to examine the prospective impact of fear avoidance in pregnancy on this pain at 3 months postpartum. Consistent with the hypothesis, greater pain-related anxiety (i.e., fear of pain, anxiety, and avoidance) in late pregnancy was associated with greater genito-pelvic pain intensity and unpleasantness at 3 months postpartum. These results are in line with previous studies, which found that women with localized genital pain and women with a bladder pain syndrome experienced greater fear of pain, anxiety, and avoidance than women without these pain conditions [30,31,33].

Pain catastrophizing and hypervigilance to pain together accounted for a significant amount of variance in postpartum genito-pelvic pain outcomes; however, they were not independent predictors of this pain. In previous studies of women with localized genital pain unrelated to childbirth,

catastrophizing and hypervigilance to pain were higher in comparison with women without this pain [31,32], and catastrophizing was a robust predictor of greater genital pain [28,29] and pain intensity in labor [2]. Due to the strong positive correlation between pain-related anxiety and catastrophizing, the fear avoidance model could not be tested with all of the variables in one model in the current study. Indeed, these variables were so closely linked that they could not be considered distinct factors, suggesting that there may be fewer independent factors in the fear avoidance model, at least in the current sample. It is important for researchers examining the fear avoidance model to assess all of its factors in order to best understand which variables contribute to pain and whether the variables in the model are unique. In the current sample, pain-related anxiety was an independent predictor of postpartum genito-pelvic pain intensity and suffering. Perhaps the factors associated with genito-pelvic pain in pregnant women are different than in women who are not pregnant. Pain-related anxiety may be an especially salient factor for pregnant women because they are anticipating the pain associated with labor. Indeed, many pregnant women experience substantial anxiety and fear about the pain that is associated with labor [53]. Consistent with the fear avoidance model, this enhanced fear and anxiety may lead to greater genito-pelvic pain and associated discomfort postpartum.

In future research, the impact of pain-related anxiety on the maintenance of genito-pelvic pain should be assessed beyond 3 months postpartum to determine whether this factor is associated with developing chronic genito-pelvic pain. Future studies should also examine the influence of pain-related anxiety on how genito-pelvic pain affects individuals' functioning in their daily lives, for example, in their sexual relationships. The potential disruption to women's sexual relationships is important to consider given that the extent to which pain interferes with a person's life is more predictive of whether the individual will seek treatment than the pain itself [54]. In studies of chronic pain, fear avoidance was associated with greater pain-related disability [55].

An improved understanding of the prospective influence of psychosocial variables could help health care providers identify women that are at risk for experiencing postpartum genito-pelvic pain. Health care providers could screen women for pain-related anxiety during pregnancy and offer intervention focused on this factor. Interventions

based on the fear avoidance model have demonstrated promising results in individuals suffering from chronic pain (e.g., low back pain) [56] and in women with localized genital pain [29]. Such interventions may involve cognitive behavioral therapy (CBT), which encourages individuals to take an active role in pain management, to reduce avoidance, and to challenge irrational expectations that arise from pain-related anxiety. Studies have found that fear avoidance interventions were superior to standard treatments (e.g., exercise) in reducing fear avoidance and pain-related disability [56,57]. Further, a treatment outcome study of women with localized genital pain found that lower fear avoidance predicted better pain outcomes in women who underwent CBT [29]. The current findings suggest a need for developing and testing the effect of pain-related anxiety interventions for women with genito-pelvic pain related to pregnancy and postpartum. Decreased anxiety, fear of pain, and avoidance may lower genito-pelvic pain intensity and discomfort, which could improve women's ability to cope with the pain, improve sexual functioning, facilitate the speed of recovery, and possibly reduce the risk of developing postpartum depression or a chronic pain problem.

This study has some limitations. First, self-report measures were used to assess the variables of interest. Future research could assess genito-pelvic pain with a gynecological examination in order to enhance the validity and reliability of the symptom profile of this pain. Second, 59% of women who consented to the study completed both time points, which is consistent with participation rates in other studies with this population [7,10]. Women who participated in the study were more educated than those who did not complete both time points, limiting the generalizability of the findings. Third, the assessment of whether women experienced nongenito-pelvic pain prior to pregnancy did not capture the overall duration of the pain. Fourth, consistent with previous studies with postpartum populations [8,15,58], patients self-reported the presence or absence of childbirth-related risk factors. Information regarding the type of episiotomy, severity of perineal/vaginal tearing, size of baby and mother, and length of postdelivery hospital stay may be important considerations for future research. Fifth, although the persistent pain group consisted of women who reported pain in both pregnancy and postpartum, the location of the pain may have changed from pregnancy to postpartum, potentially resulting in two different kinds of pain

in the same woman. Finally, given that there were only three women with a nationality other than Canadian, the effect of nationality on postpartum genito-pelvic pain should be interpreted with extreme caution and replicated with a larger sample.

Conclusions

Half of the women in the study experienced genito-pelvic pain during pregnancy and approximately one-quarter reported this pain at 3 months postpartum. More research is needed to further describe this pain experience, examine additional predictors of onset and intensity, and determine the long-term trajectory of the pain. Women who reported recurrent prepregnancy nongenito-pelvic pain were more likely to have experienced postpartum onset of pain. Pain-related anxiety in pregnancy was associated with greater pain intensity and unpleasantness of postpartum genito-pelvic pain. Identifying women with prepregnancy pain conditions and targeting pain-related anxiety in interventions could improve the quality of life of many women as postpartum genito-pelvic pain is a highly common women's health problem.

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