Fear-avoidance beliefs: A predictor for postpartum lumbopelvic pain

Mia Fernando1 | Lena Nilsson-Wikmar2,3 | Christina B. Olsson2,3

1Rehab Södra, Region Stockholm, Stockholm, Sweden
2Department of Neurobiology, Care Sciences and Society, Division of Physiotherapy, Karolinska Institutet, Stockholm, Sweden
3Academic Primary Healthcare Centre, Region Stockholm, Stockholm, Sweden

Correspondence
Christina B. Olsson, Danderyds Akademiska Vårdsentral, Golfvägen 8, pl 5, SE-182 31 Danderyd, Sweden.
Email: christina.b.olsson@sll.se

Abstract
Objective: To evaluate potential prognostic factors of self-reported lumbopelvic pain 6 months postpartum for pregnant women with and without lumbopelvic pain.
Methods: Questionnaires were answered at gestational weeks 34–37 and again at 6 months postpartum. Psychosocial determinants and lumbopelvic pain symptoms were investigated using a visual analogue scale to assess pain intensity, and further using the Disability Rating Index, the Nottingham Health Profile, the Pain Catastrophizing Scale and the Fear-Avoidance Beliefs Questionnaire. Logistic regression analysis was used to analyse the data.
Results: Of the 260 women who answered the questionnaires on both occasions, 186 did not suffer from lumbopelvic pain 6 months after pregnancy. The remaining 74 did. The results of the logistic regression analysis showed that fear-avoidance beliefs was a significant predictor of lumbopelvic pain 6 months postpartum, with an odds ratio of 1.060 (p ≤ .05).
Conclusion: Women with high fear-avoidance beliefs at 34–37 weeks of gestation had a higher risk of having lumbopelvic pain at 6 months postpartum. We theorize that early lumbopelvic pain intervention postpartum may be important in avoiding chronicity. Women at risk can be identified through clinically relevant questions which may help the clinician to choose appropriate rehabilitation strategies.

KEYWORDS
back pain, pelvic girdle pain, postpartum period, pregnancy

1 | INTRODUCTION

‘Lumbopelvic pain (LP)’ is a general term used when no distinction is needed between pelvic girdle pain (PGP) and low back pain (LBP) (van Tulder et al., 2006). Pregnancy-related low back pain (PLBP) and PGP are common during pregnancy and affect around half of all pregnant women (Kovacs, Garcia, Royuela, Gonzalez, & Abraira, 2012; Mogren & Pohjanen, 2005; Wu et al., 2004). For most women, LP during pregnancy is self-limiting (Bergstrom, Persson, & Mogren, 2016). However, for some women, pain and disability are still present 2–11 years postpartum (PP) (Albert, Godskesen, & Westergaard, 2001; Elden, Gutke, Kjellby-Wendt, Fagevik-Olsen, & Ostgaard, 2016; Wu et al., 2004). For the majority of women with persistent LP PP, there are no patho-anatomical abnormalities (Vleeming, Albert, Ostgaard, Sturesson, & Stuge, 2008). Risk factors for having PP LP have been reported to be LBP before pregnancy (Mogren & Pohjanen, 2005), previous trauma to the pelvis, and high pain levels and a greater number of pain sites (Albert et al., 2001; Gutke, Ostgaard, & Oberg, 2008; Wu et al., 2004) during pregnancy. Additionally, one study found that lower functional ability when having LP during weeks 19–21 of pregnancy...
more than doubles the risk for PP LP (Olsson, Nilsson-Wikmar, & Grooten, 2012). In a non-pregnant population, psychological factors could play an important role for the prognosis of patients with LBP (Melloh et al., 2009). During pregnancy, pain features and psychological risk factors have been shown to be important for development of persistent pain after delivery (Beales, Lutz, Thompson, Wand, & O’Sullivan, 2016). Factors that have been found to be correlated to LP during and after pregnancy are fear-avoidance beliefs and kinesiophobia as well as catastrophizing (Olsson, Grooten, Nilsson-Wikmar, Harms-Ringdahl, & Lundberg, 2012; Olsson, Nilsson-Wikmar, & Grooten, 2012).

It is known that women with LP during and after pregnancy have a decreased quality of life compared with women without pain (Gutke, Lundberg, Ostgaard, & Oberg, 2011). Moreover, chronic pain is independently related to low self-rated health in the general population (Mantyselka, Turunen, Ahonen, & Kumpusalo, 2003).

Given that one in three women report having LP or PGP PP, and that about 8.6% still suffer from LP or PGP about 2 years after pregnancy, this should be seen as a major health issue for a considerable portion of the able-bodied population (Albert et al., 2001; Gutke et al., 2011). LP should therefore be a prioritized area of study to facilitate the prediction and early detection of remaining pain after pregnancy (Bakker, van Nimwegen-Matzinger, Ekkel-van der Voorden, Nijkamp, & Vollink, 2013). There is a need for clinicians to know more about predisposing factors in order to identify the women most in need of interventions and rehabilitation efforts (Elden et al., 2016).

Hence, the aim of this study is to evaluate whether the variables of level of pain, physical ability, health-related quality of life (HRQL), catastrophizing and fear avoidance, in women with and without LP during gestational weeks 34–37, are associated with LP 6 months PP. The hypothesis is that scoring high in the targeted variables during gestational weeks 34–37 is a predictor of PP LP.

2 | METHODS

In this study LP is defined as self-reported pain in the region of the lower back and/or anterior and/or posterior region of the pelvis (Olsson, Buer, Holm, & Nilsson-Wikmar, 2009).

2.1 | Study design

This study was part of a prospective cohort study including three points of measurement: gestational weeks 19–21, weeks 34–37 and 6 months postpartum. In this study, women in week 34–37 of pregnancy answered questionnaires including demographic variables and instruments for level of pain, physical ability, HRQL, catastrophizing and fear avoidance. These answers were used to predict the primary outcome, self-reported LP at 6 months PP.

Approval for this study was obtained from the Regional Ethics Committee at the Karolinska Institutet, Stockholm (031006, dnr 03–503) and the study followed the ethical standards of the Declaration of Helsinki. Informed oral consent was obtained from the participants.

2.2 | Subjects

Women with or without LP during pregnancy were recruited from five midwife clinics in three different demographic areas of Sweden during March 2005 to September 2006. They were invited to join the study during gestational weeks 19–21. Participants received written and verbal information about the study from their midwives. Details of recruitment and data collection are described elsewhere (Olsson et al., 2009; Olsson, Nilsson-Wikmar, & Grooten, 2012). A total of 470 women were recruited during gestational weeks 19–21. Of these women, 369 were sent questionnaires during gestational weeks 34–37 as well as 6 months PP. In total 260 women submitted their answers at both week 34–37 and 6 months PP and were included in this study. Missing ambient data in questionnaires did not lead to exclusion from the study. Figure 1 shows the flowchart of the study.

2.3 | Materials

The questionnaires included demographic questions about age, marital status, employment/occupation, exercise, number of previous pregnancies, sick leave (including onset of sick leave), and frequency and location of LP.

The primary outcome was self-reported LP at 6 months PP using dichotomous questions. Six instruments were used in the study:

- (1 and 2) Pain intensity, at the time of answering the questionnaire (1) and at its maximum (2), was estimated on a visual analogue scale (VAS) (Carlsson, 1983).
- (3) The Disability Rating Index (DRI) consists of 12 VASs that allow respondents to rate their ability to perform daily physical activities (Salen, Spangfort, Nygren, & Nordemar, 1994). The scale ranges from 0 to 100 mm. The mean score of the 12 ratings is used as a rating index, where 0 indicates low disability and 100 indicates high disability.
- (4) The Nottingham Health Profile (NHP) is a generic health status instrument for assessing quality of life (Wiklund, Romanus, & Hunt, 1988), here referred to as health-related quality of life (HRQL). The NHP is divided into two parts, one part which consists of 38 statements that cover limitations or distress in six sub-areas: emotional reactions, sleep, energy, pain, physical mobility and social isolation. Questions in each sub-area are weighted and the sum of all weighted values in a given sub-area adds up to 100. The total score, the mean of each sub-area score, is the indicator of HRQL. The summarized score ranges from 0 to 100, where 0 indicates good health and 100 poor health. Part two consists of seven questions mapping seven affected areas of life; this part was not analysed in this study.
- (5) The Pain Catastrophizing Scale (PCS) is a 13-item self-report measure. The items reflect experiences of pain and scores indicate whether or not the respondent has exaggerated negative thoughts (Osman et al., 1997). Each item is rated on a 5-point scale ranging from 0 to 4, with a total score range of 0–52, where a higher score indicates a higher degree of catastrophizing. The PCS conceptualizes catastrophizing as a single construct with three dimensions, where a separate score is derived for each dimension. In this study the total score was used.
The Fear-Avoidance Beliefs Questionnaire (FABQ) focuses on respondents' beliefs about how physical activity and work affect or may affect their LBP (Waddell, Newton, Henderson, Somerville, & Main, 1993). It is a 16-item, two-factor, self-report questionnaire in which the items are scored on a 7-point Likert scale. The FABQ measures beliefs by using response options ranging from 0 (strongly disagree) to 6 (strongly agree). Two sum scores are obtained, one for physical activity and one for work. High scores (with a maximum of 24) indicate increased levels of fear-avoidance beliefs. In this study only the score for physical activity was analysed, since the work subscale contains items that are not applicable during pregnancy.

The DRI, NHP, PCS and FABQ have been shown to have good validity and reliability for women with PGP (Grotle, Garratt, Krogstad Jenssen, & Stuge, 2012; Hunt, McEwen, & McKenna, 1985).

3 | PROCEDURE

The t-test was used for comparison of normally distributed data between two groups. The Mann–Whitney U test for other comparisons. Possible relationships based on nominal data were tested with Chi²-test. Other relationships based on ordinal data were tested with
Spearman’s correlation coefficient. The correlation was interpreted according to Colton’s guidelines (Colton, 1974): correlations ranging from 0.00 to 0.25 indicate little or no relationship; those from 0.25 to 0.50 suggest a fair degree of relationship; values of 0.50–0.75 are moderate to good; and values above 0.75 are considered good to excellent.

Logistic regression analysis was performed to determine statistically significant predictors of LP 6 months PP. The six variables to be tested as predictors were: (a and b) pain intensity at present and at worst (VAS), (c) physical ability (DRI-total score), (d) HRQL (NHP-total score), (e) catastrophizing (PCS-total score), and (f) fear-avoidance beliefs (FABQ-activity).

Available background factors were tested for confounding one at a time together with each potential predictor and considered significant if they were associated with the outcome (p ≤ .10) or if they changed the В-coefficient of the exposures by as much as 10%. The tested confounding variables were dichotomized into yes/no: sedentary occupation, first pregnancy, onset of pain ≤ week 11, exercise before pregnancy, exercise at weeks 34–37, reporting daily or constant pain during pregnancy, LP at weeks 19–21, LP at weeks 34–37, pregnancy benefit, sick leave, and Caesarean section. Age was used as a continuous variable. None of the tested confounders changed the coefficient of the exposures by 10% or more. All confounders were significantly associated with the outcome together with at least three of the potential predictors. To avoid too many variables in the models, the confounders were further tested against the outcome with chi²-test. Reporting LP at weeks 19–21, LP at weeks 34–37, or daily or constant pain were significantly related to the outcome and were included in the adjusted models.

Binary logistic regression models were used to identify associations between predictors and the outcome of interest, LP at 6 months postpartum.

### TABLE 1 Cross-tabulation of variables and differences between number of women with and without lumbopelvic pain 6 months postpartum

| Variables                              | Dichotomization | Total number (n = 260) | Number of women NLP, 6 months postpartum (n = 186) | Number of women LP, 6 months postpartum (n = 74) | p-value |
|----------------------------------------|-----------------|------------------------|---------------------------------|--------------------------------|---------|
| Mean agea, years (SD)                  | N/A             | 31.1 (4.7)             | 31.3 (4.6)                      | 30.6 (5.1)                   | .258e   |
| Occupationb                            | Sedentary       | 167                    | 125                             | 42                           | .261f   |
|                                        | Non-sedentary   | 68                     | 46                              | 22                           |         |
| First pregnancy                       | Yes             | 140                    | 101                             | 39                           | .764f   |
|                                        | No              | 115                    | 81                              | 34                           |         |
| Onset of LP at ≤ week 11 of pregnancy | Yes             | 173                    | 124                             | 49                           | .767f   |
|                                        | No              | 83                     | 58                              | 25                           |         |
| LP at weeks 19–21                     | Yes             | 105                    | 66                              | 39                           | .015f   |
|                                        | No              | 151                    | 116                             | 35                           |         |
| LP at weeks 34–37                     | Yes             | 161                    | 100                             | 61                           | <.001f  |
|                                        | No              | 99                     | 86                              | 13                           |         |
| Exercise before pregnancyc            | Yes             | 186                    | 130                             | 56                           | .391f   |
|                                        | No              | 69                     | 52                              | 17                           |         |
| Exercise during weeks 34–37c          | Yes             | 109                    | 79                              | 30                           | .750f   |
|                                        | No              | 150                    | 106                             | 44                           |         |
| Reporting daily or constant pain      | Yes             | 56                     | 28                              | 28                           | <.001f  |
|                                        | No              | 200                    | 155                             | 45                           |         |
| Received pregnancy benefit            | Yes             | 54                     | 40                              | 14                           | .629f   |
|                                        | No              | 205                    | 145                             | 60                           |         |
| Sick leaved                            | Yes             | 57                     | 37                              | 20                           | .218f   |
|                                        | No              | 202                    | 148                             | 54                           |         |
| Caesarean section at delivery         | Yes             | 37                     | 29                              | 8                            | .330f   |
|                                        | No              | 221                    | 156                             | 65                           |         |

Note: All variables are dichotomous and given as numbers, except for age, which was continuous and is given in years. The number of total reported answers for each variable varies due to missing answers in some questionnaires.

Abbreviations: LP, lumbopelvic pain; N/A, not applicable; NLP, no lumbopelvic pain.

*Mean age was calculated for a total of 255 women, 181 with NLP, and 74 with LP, at 6 months PP.

*Working at present (students included, maternity leave and sick leave not included).

*Minimum of 45 min/week.

*Sick leave, full or part-time.

*t-test.

*chi²-test.
PP. Each potential predictor was tested separately against the outcome in unadjusted models. If the predictor was significantly associated (i.e. \( p < .10 \)) with the outcome of interest, the variable was used in adjusted regression models. Statistical significance was set at \( p \leq .05 \) for the estimates of association in the adjusted models. The strength of associations was measured using odds ratios (ORs) and the precision of these estimates was calculated using 95% confidence intervals (CIs).

We tested for interaction between the potential predictors. To avoid multicollinearity problems in the logistic regressions, variation inflation factor (VIF) was used and no violation was observed. Four different models were created: VAS at worst, DRI/PCS, FABQ, and NHP. The fit of the four models, containing predictors and founders, was assessed with the Hosmer–Lemeshow goodness-of-fit test. The models were considered acceptable at \( p > .05 \) and all models met this criterion.

The logistic regression model for LP at 6 months PP showing the odds ratios for FABQ in week 34–37 adjusted for reporting LP at weeks 19–21, LP at weeks 34–37, or daily or constant pain, was used to estimate a restricted cubic spline. The number of knots used in the model are 4 and the median of FABQ was used as a reference.

Statistical analyses were performed using IMB SPSS for Windows, v 24.0 (IBM Corp., Armonk, NY), and restricted cubic spline was performed by SAS version 9.4 (SAS Institute Inc., Cary, NC).

### 4 RESULTS

In total, 260 women answered the questionnaires at weeks 34–37 of pregnancy as well as 6 months PP and were included in the study. The mean age was 31.1 years (SD 4.7). Table 1 shows the cross-tabulations of the chosen variables.

At 6 months PP, 74 out of 260 participants (29%) experienced LP. Out of the 161 women who reported LP during gestational weeks 34–37, 61 (38%) had LP at 6 months PP. Of the 99 women who reported no LP during gestational weeks 34–37, 13 (13%) experienced LP at 6 months PP. Table 2 shows the scores for the potential predictors in week 34–37 and 6 months PP.

Table 3 shows the interaction between the potential predictors. In the logistic regression analysis the ORs for the potential predictors did not differ much between the unadjusted and the adjusted models. The results prove the FABQ model to be a small, but significant

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**TABLE 2** Scores for potential predictors for women in week 34–37 of pregnancy and for women with (LP) and without (NLP) lumbopelvic pain postpartum

| Potential predictors, scores | Total number of women answering | Women in week 34–37 | Women 6 months postpartum |
|-----------------------------|--------------------------------|---------------------|---------------------------|
|                            | Total median (min, max) | NLP n = 99 median (min, max) IQR | LP n = 161 median (min, max) IQR | p-value* | NLP n = 186 median (min, max) IQR | LP n = 74 median (min, max) IQR | p-value* |
| VAS-present 0–100           | 158                          | 22 (0, 92.5) | 22 (0, 92.5) | N/A | 29.9 | 13.8 (0, 72) | 12 | 22 |
| VAS-worst 0–100             | 158                          | 65.8 (14.5, 99.5) | 65.8 (14.5, 99.5) | N/A | 33.0 | 50.5 (2, 100) | 34 |
| DRI 0–100                   | 259                          | 43.9 (0, 94.5) | 32.2 (0, 89.5) | N/A | 28.9 | 52.3 (4.5, 94.5) | 30 | 1.94 |
| NHP 0–100                   | 257                          | 20.7 (0, 90) | 7.5 (0, 52) | N/A | 21 | 29.2 (0, 90) | 22 | 1.04 |
| PCS 0–52                    | 257                          | 12 (0, 52) | 9.5 (0, 52) | N/A | 14 | 14 (0, 45) | <.01 | 1.9 |
| FABQ-activity 0–24          | 239                          | 13 (0, 24) | 9 (0, 24) | N/A | 15 | 0 (0.18) | <.001 | 0 |

Note: Differences between women with and without lumbopelvic pain. Only women with LP rated their pain on a VAS.

Abbreviations: DRI, Disability Rating Index, high scores indicate higher disability; FABQ, Fear-Avoidance Beliefs Questionnaire, high scores indicate increased levels of fear-avoidance beliefs; IQR, inter quartile range; LP, lumbopelvic pain; N/A, not applicable; NHP, Nottingham Health Profile, high scores indicate lower health-related quality of life; NLP, no lumbopelvic pain; PCS, Pain Catastrophizing Scale, high scores indicate higher extent of catastrophizing; VAS, visual analogue scale.

*Mann-Whitney U test.
TABLE 3  Bivariate correlation matrix between included potential predictors to test interactions

|                          | VAS at present | VAS at worst | DRI-total score | NHP-total index | PCS-total score | FABQ-activity total score |
|--------------------------|----------------|--------------|-----------------|-----------------|-----------------|--------------------------|
| VAS-at present           | 1              |              |                 |                 |                 |                          |
| VAS-at worst             | 0.682          | 1            |                 |                 |                 |                          |
| DRI-total score          | 0.641          | 0.583        | 1               |                 |                 |                          |
| NHP-total index          | 0.473          | 0.525        | 0.695           | 1               |                 |                          |
| PCS-total score          | 0.271          | 0.321        | 0.313           | 0.375           | 1               |                          |
| FABQ-activity total score| 0.411          | 0.524        | 0.505           | 0.487           | 0.326           | 1                        |

Note: All correlations had a (two-tailed) significance of \( p < .01 \).

Abbreviations: DRI, Disability Rating Index; FABQ, Fear-Avoidance Beliefs Questionnaire; NHP, Nottingham Health Profile; PCS, Pain Catastrophizing Scale; VAS, visual analogue scale.

TABLE 4  Results of logistic regression analysis for each potential predictive model

| Variables                      | Adjusted\(^a\) | Unadjusted |
|--------------------------------|-----------------|------------|
|                               | VAS-at-worst OR (95% CI) | DRI/PCS OR (95% CI) | NHP OR (95% CI) | FABQ OR (95% CI) | PWS OR (95% CI) |
| VAS-at present                | 1.004 (0.988–1.02) | 1.014 (0.998–1.03) | 1.032 (1.016–1.04) | 1.091 (1.039–1.14) | 1.958 (1.853–2.14) |
| VAS-at worst                   | 1.006 (0.988–1.02) | 1.014 (0.998–1.03) | 1.032 (1.016–1.04) | 1.091 (1.039–1.14) | 1.958 (1.853–2.14) |
| DRI-total score                | 1.01 (0.993–1.02) | 1.024 (1.011–1.03) | 1.032 (1.016–1.04) | 1.091 (1.039–1.14) | 1.958 (1.853–2.14) |
| NHP-total score                | 1.017 (0.996–1.03) | 1.032 (1.016–1.04) | 1.032 (1.016–1.04) | 1.091 (1.039–1.14) | 1.958 (1.853–2.14) |
| PCS-total score                | 1.008 (0.975–1.04) | 1.029 (1.000–1.05) | 1.032 (1.016–1.04) | 1.091 (1.039–1.14) | 1.958 (1.853–2.14) |
| FABQ-activity total score      | 1.060 (1.005–1.118) | 1.091 (1.039–1.145) | 1.958 (1.133–3.385) | 1.958 (1.133–3.385) | 1.958 (1.133–3.385) |
| LP at weeks 19–21              | 0.978 (0.489–1.95) | 0.949 (0.569–1.98) | 1.15 (0.616–2.14) | 1.15 (0.616–2.14) | 1.958 (1.133–3.38) |
| LP at weeks 34–37              | 0.999 (1.25–5.59) | 0.999 (1.15–5.32) | 1.877 (0.873–4.03) | 1.877 (0.873–4.03) | 4.035 (2.076–7.84) |
| Daily or constant pain         | 1.978 (0.916–0.427) | 1.978 (0.808–3.64) | 1.671 (0.783–3.56) | 1.671 (0.783–3.56) | 3.444 (1.853–6.40) |

Note: Results are presented as odds ratio (OR) with a 95% confidential interval (CI) and significance at \( p \leq .05 \). In the unadjusted models, each variable was tested separately against the outcome.

Abbreviations: DRI, Disability Rating Index; FABQ, Fear-Avoidance Beliefs Questionnaire; NHP, Nottingham Health Profile; OR, Odds ratio; PCS, Pain Catastrophizing Scale; VAS, visual analogue scale.

\(^a\)All models were adjusted for reporting lumbopelvic pain in week 19–21, lumbopelvic pain in week 34–37 (not VAS-at worst model) and daily or constant pain during pregnancy.

\(^b\)\( p \leq .05 \) in the adjusted models.
predictor of LP at 6 months PP, with an adjusted OR of 1.060 \((p \leq .05)\), as presented in Table 4.

As illustrated in Figure 2 by restricted cubic spline curve, the risk for LP 6 months PP in the studied population significantly increased for women scoring above 13 (the median for the whole population in week 34–37).

5 | DISCUSSION

The hypothesis of this study was that level of pain, physical ability, HRQL, catastrophizing and fear avoidance are associated with LP at 6 months PP in women with and without LP during gestational weeks 34–37. The main results indicate that women with higher levels of fear-avoidance beliefs at 34–37 weeks of gestation also had a higher risk of having LP at 6 months PP. In this cohort, pain intensity, physical ability, HRQL and catastrophizing were not significant predictors for LP at 6 months PP.

5.1 | Fear avoidance

Fear avoidance has previously been shown to be linked to the experience of labour pain and to the resumption of daily activities during PP recovery (Flink, Mroczek, Sullivan, & Linton, 2008). The fear-avoidance model of pain indicates that the experience of pain is influenced by a range of emotional, cognitive, biological and behavioural factors (Vlaeyen & Linton, 2000). When applied to our results, this means that women with high levels of fear avoidance may interpret pain during and after pregnancy as menacing, which could affect the way they experience their physical ability and quality of life. This could focus their attention on the pain, leading to a higher estimate of pain intensity and consequently a higher reported prevalence of LP (Bjelland, Stuge, Engdahl, & Eberhard-Gran, 2013). Our results contradict previous findings that FABQ is linked to neither PGP during pregnancy nor LP PP (Olsson, Nilsson-Wikmar, & Grooten, 2012; Robinson, Veierod, Mengshoel, & Vollestad, 2010). However, treatment of fear and negative appraisal of pain are important factors when treating acute and chronic pain (Quartana, Campbell, & Edwards, 2009). This suggests that fear avoidance may be involved in the development of LP PP, and that further investigation is needed.

5.2 | Physical ability, HRQL, catastrophizing and pain

In the adjusted logistic regression analysis, pain, physical ability, HRQL and catastrophizing were not found to be significant predictors for LP, 6 months PP. However, the unadjusted logistic regression analysis and the analyses where only one confounder at a time was included with each potential predictor showed a significant correlation between physical ability and LP at 6 months PP. This is interesting, as physical ability has been shown to be associated with LP and catastrophizing (Olsson, Grooten, et al., 2012). That the model loses its significance in the adjusted model may mean that its contribution as a whole was too weak to prove association in this study. As shown by the models, development of PP LP is most likely dependent on a variety of factors.

In a previous study of pregnant women, using the same instruments of measurement, the NHP was not a significant prognostic instrument for LP at 6 months PP (Olsson, Nilsson-Wikmar, & Grooten, 2012). However, this was concluded from data obtained from questionnaires at gestational weeks 19–21. A previous study showed that HRQL was significantly lower at gestational weeks 34–37 for women with LP compared with women without LP (Olsson & Nilsson-Wikmar, 2004). Therefore, we theorize that the further the pregnancy progresses, the more explicit will be the experienced fears, symptoms and disabilities, which may negatively affect HRQL. Furthermore, in a general population, low HRQL has been shown to be a contributing prognostic factor for LBP (Coste, Lefrancois, Guillemin, & Pouchot, 2004). Therefore, the impact and prognostic capability of poor quality of life on PP LP may be strongly linked to the later part of pregnancy. However, in agreement with previous studies (Bergstrom, Persson, & Mogren, 2014; Elden et al., 2016), this study shows that low HRQL during pregnancy was not associated with PP LP in the study population.

Pain catastrophizing is conceptualized as a negative cognitive-affective response to anticipated or actual pain and has been associated with a number of important pain-related outcomes (Quartana et al., 2009). Previous studies have shown that catastrophizing could play a bigger role in PP recovery and that catastrophizing in mid-pregnancy may be associated with LP at 6 months PP (Flink...
et al., 2008; Olsson, Grooten, et al., 2012). Moreover, it has been found that catastrophizing pregnant women are at an increased risk of developing both acute and persistent genito-pelvic pain shortly after delivery (Glowacka, Rosen, Chorney, Snelgrove Clarke, & George, 2014; Soares et al., 2013). Therefore, catastrophizing may be a mid-pregnancy predictor of PP LP: as a late pregnancy prognostic tool it may be more closely related to genito-pelvic recovery. In earlier work on back pain at 12 months PP, 77% of study participants reported some level of back pain, and no differences were found between the obstetric characteristics of women who experienced back pain during pregnancy and those who did not, nor in the events of labour and delivery (Mannion, Vinturache, McDonald, & Tough, 2015). Low back pain is an extremely common problem that most people experience at some point in their life (Hoy, Brooks, Blyth, & Buchbinder, 2010). In particular, women have shown high incidence in PP LBP due to factors like lifting and carrying their child (Sanders & Morse, 2005). It may be possible that the time after pregnancy can be associated with back pain, independent of pain during pregnancy.

5.3 | Rehabilitation perspective

There are no studies reporting administration of corrective and preventive actions targeting PP LP. The mechanisms that lead to LP after pregnancy are complex, which means that there is no single psychological or biomechanical factor that can be targeted prior to onset of PP LP. However, application of prognostic models during pregnancy could be useful to identify women who are at higher risk of prolonged LP. Having identified these women, clinicians could then respond with appropriate interventions in the event of initial onset of PP LP. Despite the small size of the association, the results of the present study suggest that the assessment of fear avoidance beliefs and rehabilitation strategies directed at modifying these beliefs could be further considered by clinicians working with pregnant women. In a study of subjects with LBP and the risk of it developing into a chronic disability, high-risk subjects who received early intervention showed statistically significantly fewer risks of chronic pain disability (Gatchel et al., 2003). Therefore, we theorize that an early intervention in PP LP may be of great importance in avoiding chronicity.

5.4 | Strengths and limitations

One strength of this study is that the distribution of women experiencing PP LP in this study is similar to distributions reported in other studies (Elden et al., 2016; Gutke et al., 2011). Furthermore, the distribution of participants with LP at weeks 19–21 who reported PP LP also corresponds well with previous reports (Gutke et al., 2011; Olsson, Nilsson-Wikmar, & Grooten, 2012). Yet another strength is that the subjects were spread across different geographical areas, representing a wide variation in socioeconomic status.

The design of this study was suitable for identifying potential predictors. As there is a limited number of reports in this field, this study adds to the body of evidence on PP back pain. The most important limitation is that all data were self-reported. However, as the results are not specific to the affected body part or the source of pain, self-report was the most appropriate method (Olaogun, Adegbenro, Ikem, & Akinjobi, 2004). Of the 289 eligible women in week 34, 29 women (10%) answered the questionnaires in weeks 34–37 and 260 women (90%) answered in weeks 34–37 of pregnancy as well as 6 months PP and hence were included in the present study. The 29 women excluded from the analysis did not differ from the 260 women included in the analysis in terms of characteristics and FABQ scores in weeks 34–37. At the time the cohort was chosen, no distinction had yet been made within the field of research for different sub-types of LP. This may complicate comparisons with later studies that use other sub-types of LP than used in this cohort. Later research has included clinical assessment to classify pregnancy-related LP according to pain location. Women with combined pain, that is, both PGP and PLBP, seem to be more affected and demonstrate less recovery (Gutke et al., 2008; Gutke, Ostgaard, & Oberg, 2006).

5.5 | Implications for further research

A longitudinal study is required to establish the importance of gestational week and fear avoidance and the predictive effects on LP and recovery after pregnancy. It would also be interesting to see further studies on the subject of persisting LP after pregnancy, and the type and location of pain.

5.6 | Implications for physiotherapy practice

Women with high fear avoidance at 34–37 weeks’ gestation had a slightly higher risk of having LP at 6 months PP. This is a contribution to the body of evidence regarding tools which can be used to clinically predict which pregnant women are at risk of LP. It seems important to take these results into consideration when developing rehabilitation strategies for women with PP LP.

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