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Risk factors in developing pregnancy-related pelvic girdle pain

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Abstract

Background. In this prospective epidemiologic cohort study the aim was to identify possible risk factors for developing four different syndromes of pelvic girdle pain during pregnancy. *Methods.* Over a one-year period a total of 2,269 consecutive pregnant women – at week 33 of gestation – responded to a structured questionnaire and underwent a thorough physical examination. Women who at baseline reported daily pain from pelvic joints and had corresponding objective findings were allocated, according to symptoms, into one of four classification groups, and followed up with questionnaires and physical examinations up to two years after delivery. *Results.* Multivariate analysis could distinguish the four pelvic pain sub groups from the "Pelvic healthy" group with respect to 13 of 24 variables. The pelvic girdle syndrome group revealed a history of previous low back pain, trauma of the back or pelvis, multiparae, had a relatively higher weight, a higher level of self reported stress and of job At a higher risk of developing symphysiolysis were women who were multiparae, had a relatively higher weight, and were smokers. If a woman had vocational training or a professional education, was stressed, had a poorer experience of previous delivery, had previous low back pain, trauma of back, or previous salpingitis, she had an increased risk of developing one-sided sacroiliac syndrome. The risk factors for developing double-sided sacroiliac syndrome were previous low back pain and trauma of the back or pelvis, multiparae, poorer relationship with spouse, and less job satisfaction. *Conclusions.* This study demonstrates no single dominant risk factor for developing pelvic girdle pain in pregnancy, but reveals a set of physical and psychosocial factors. The risk factors for developing pelvic girdle pain in general are: history of previous low back pain, trauma of the back or pelvis, multivariate, higher level of stress, and low job satisfaction.

Key words: *Pelvic girdle pain, pregnancy, low back pain, epidemiology, risk factors*

Abbreviations: *OR: odds ratio, BMI: body mass index*

Pelvic pain during pregnancy is a substantial problem affecting one in five pregnant women (1–3). Furthermore, one in four of the most incapacitated women (pelvic girdle syndrome) develop chronic postpartum pain (4).

Only a few epidemiologic observational studies have attempted to determine possible risk factors for developing pelvic girdle pain in pregnancy. The majority of information concerning risk factors is obtained from studies in which the original purpose was nonepidemiologic (5–8).

Four prospective epidemiologic studies have been performed in this area. Berg et al. (9) followed 862 women three times during pregnancy. Of these, 72 women complained of severe pain and were referred to an orthopedic surgeon for examination. Risk factors were previous history of low back pain, heavy work, and smoking (covariance with heavy work). Ostgaard et al. (2, 10) followed 855 women 7–9 times during pregnancy. If a woman reported back pain she filled out a pain drawing and a questionnaire. They discovered that the risk factors for developing low back and pelvic pain during pregnancy were: previous history of low back pain, multiparae, young age, heavy workload, and if the woman considered her back to be weak. Kristiansson

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et al. (11) studied 200 women with a physical examination and a comprehensive questionnaire three times during pregnancy and once 12 weeks after delivery. They found the following risk factors for developing back pain: previous history of low back pain, multiparae, and a relatively higher weight during pregnancy. In a study performed by Larsen et al. (12), 227 out of 1,600 pregnant women fulfilled the criteria for pelvic pain. Analyzing with logistic regression analysis, the following risk factors were found to be significant: previous history of low back pain, pelvic pain in previous pregnancy, not doing regular exercise, and mother or sister with pelvic pain in previous pregnancy.

Previously, the hormone relaxin was thought to be involved in the etiology of pregnancy-related pelvic girdle pain. In early studies (13), an increased concentration of serum relaxin was found to be a risk factor. This correlation has not, however, been confirmed by subsequent studies using human relaxin essays (14,15).

Unfortunately, the literature gives an unequivocal picture; multiple risk factors are stated, but not always the same, and sometime conflicting results are reported. This is most probably due to the differences in study design and classification procedures.

The aim of the study was, by defining the criteria meticulously, to find specific prognostic factors for developing girdle pain in general and in four defined subgroups.

Methods

The present study was part of a prospective epidemiologic study of pregnancy-related pelvic joint pain including a cohort of 2,269 consecutive women.

Inclusion criteria: the woman should be in week 33 of gestation as confirmed by ultrasound, and should be registered to deliver at The Odense University Hospital or Svendborg Municipal Hospital, a community hospital. The only exclusion criterion was being non-Danish speaking.

The inclusion period was exactly one year. Invitations to participate in the study were issued when these women made their first visit to the hospitals' maternity clinics. All subjects agreed to appear for subsequent appointments and meetings with the researchers.

The participants were divided into a "pelvic healthy" group ($n = 1{,}734$) (with no objective evidence of pain related to the pelvic joints) and a diseased group ($n = 535$) with pain history and objective findings from the pelvic joints. Those suffering from pelvic symptoms were classified into five subgroups– four classification groups and one miscellaneous, as described below. Examination details with the intertester reliability have been described in detail elsewhere (16).

1. Pelvic girdle syndrome: daily pain in all three pelvic joints confirmed by objective findings.
2. Symphysiolysis: daily pain in the pubic symphysis alone, confirmed by objective findings.
3. One-sided sacroiliac syndrome: daily pain from one sacroiliac joint alone, confirmed by objective findings.
4. Double-sided sacroiliac syndrome: daily pain from both sacroiliac joints, confirmed by objective findings.
5. Miscellaneous: daily pain from one or more pelvic joints, but inconsistent objective findings from the pelvic joints.

The "all pelvic pain" group includes groups 1–4.

The investigation involved a questionnaire and a physical examination performed by a physiotherapist. The questionnaire consisted of 61 questions of which 25 were aimed at a description of socioeconomic characteristics: marital status, education, present work, part-time or full-time work or unemployed, number of children living at home, presently at work or maternity leave or sick leave, and reason for sick leave. Physical characteristics: age, height, weight before pregnancy, present weight, and smoking. Obstetric history: number of previous pregnancies, number of spontaneous and provoked abortions, number of deliveries, time since last delivery, and number of living children and stillborn children. Gynecological history: salpingitis or bladder infection in the last year before pregnancy, contraceptive pills in the last 6 months before pregnancy, and hormone-induced pregnancy. Previous low back or pelvic history: low back pain in the last year before pregnancy, trauma to the back or pelvic that caused attendance to an emergency unit or a medical practitioner. Psychosocial factors: Five questions were used to evaluate some psychosocial factors in the pregnant women's personal life. The participants registered these five responses on a VAS scale.

Of these questions, 21 were used directly as risk factors and the three extrapolated from the data were: weight increase, social group, and body mass index (BMI) above 30.

The study was conducted in accordance with the Helsinki Declaration II and approved by the local ethical committee. All participants gave informed consent.

Statistics

Continuous variables are reported as median values with their 25–75 percentiles, and differences between groups were tested using the Wilcoxon rank-sum test (Mann–Whitney). Binary variables are reported as proportions and differences were tested using Fisher's exact test. In the analysis concerning risk factors for specific pelvic subgroups, a pairwise comparison was made between the "pelvic healthy" group and the individuals with each given syndrome (i.e. excluding individuals from the other subgroups).

In the univariate analysis, we carried out a pairwise comparison of the distribution of the given risk factor between the two subgroups according to the procedure described above. Variables that were significant in the univariate analyses for at least one pelvic syndrome were entered into a multivariate analysis for every syndrome where we investigated the robustness of the influence of each variable. The multivariate analysis was preformed as logistic regression and results were reported as odds ratios (OR) (and p-values) for getting the given syndrome given the risk factors. In all analyses, $p < 0.05$ was considered statistically significant.

Results

Of the 24 possible risk factors, 15 proved significant in the univariate analysis (Table I) and 9 were not. After the multivariate analysis only 13 were significant (Table II).

Some risk factors were of a generic character like low back pain in the year preceding pregnancy, where a significantly higher number of the women in all four classification groups reported low back pain during the year preceding pregnancy (Table I). In the three classification groups involving the sacroiliac joints – pelvic girdle syndrome, one-sided sacroiliac pain, and double-sided sacroiliac pain – significantly more women also reported previous trauma to the lower lumbar spine or pelvis (Table I). Multiparae is likewise a generic risk factor, hence in all groups but the one-sided sacroiliac syndrome group a significantly greater number of multiparae women suffered from pelvic girdle pain (Table I).

After the multivariate analyses, previous low back pain, previous trauma, and multiparae are still significant generic risk factors with OR between 2 and 3.5 (Table II).

Amongst the women in the pelvic girdle syndrome group and the symphysiolysis group, there were a greater number of smokers, and they had a higher average body weight prior to pregnancy compared to the "pelvic healthy" pregnant women, but only the group suffering from pelvic girdle syndrome were significantly more obese (BMI >30). In the group of women diagnosed as having double-sided sacroiliac syndrome, the increase of body weight during pregnancy was significantly higher than in the "pelvic healthy" group (Table I).

Significantly more women suffering from pelvic girdle syndrome belonged to educational group five – those with no vocational training or professional education (Table I). The multivariate analyses identified the expected correlation between social group 5, smoking, and overweight in the pelvic girdle syndrome group. The slightly increased risk associated with overweight before pregnancy (OR 1.01–1.04 pr. kg) persisted (Table II).

In the group diagnosed as having one-sided sacroiliac syndrome, significantly ($p < 0.011$) more women reported salpingitis in the year preceding pregnancy (Table I).

The psychosocial data derived from the VAS scales demonstrated that compared to the "pelvic healthy" population, women with pelvic pain and especially those having pelvic girdle syndrome experienced more daily stress, and had less job satisfaction.

The following variables revealed no differences in the univariate analysis between the "pelvic healthy" and the women with pelvic girdle pain: age, marital status, full-time work, previous stillbirth, interval between current and previous pregnancy, previous use of contraceptive pills or hormonal induced pregnancy, urinary tract infection in year preceding pregnancy, and less desire to become pregnant. The variables previous abortions and BMI >30 were eliminated in the multivariate analysis.

Discussion

This study has identified several physical and psychosocial risk factors for developing four different syndromes of pelvic girdle pain in pregnancy.

One of the most consistently investigated risk factors is previous low back pain. In this study back pain in the year preceding pregnancy proved a risk factor in all four classification groups and "all pelvic pain". The present study corroborates the research of all others (2,6,11,12,17) who have investigated this risk factor. The possible pathogenetic explanation could be answered by the theories of lack of neuromuscular control in the "inner unit" – m. Transverses abdominis and m. Multifidi. Several authors have shown that problems with the neuromuscular control in the "inner unit" are associated with low back pain (18,19). Recent

Table I. Summary of all risk factors after a univariate analysis.

Variable	Pelvic healthy $n = 1,734$	All pelvic pain $n = 490$	Pelvic girdle syndrome $n = 136$	Symphysiolysis $n = 47$	One-sided sacroiliac syndrome	Double-sided sacroiliac syndrome
	Median (25–75 percentile)/p value					
Previous history						
Low back pain (%)	21	40/***	45/***	34/*	37/***	41/***
Trauma to the back (%)	6	14/***	18/***	11/ns	13/**	13/***
Salpingitis previous year	4	6/*	6/ns	4/ns	9/*	5/ns
Multiparae (%)	46	66/***	76/***	66/**	54/ns	68/***
Contraceptive pills (%)	24	22/ns	18/ns	23/ns	29/ns	19/ns
Hormone-induced pregnancy (%)	5	3/ns	5/ns	2/ns	2/ns	2/ns
Years since last pregnancy	3.3 (2.2–5)	3.4 (2.3–5.2)ns	3.4 (2–5.6)ns	4 (2.7–4.8)ns	3.2 (2.3–5.3)ns	3.3 (2.3–5)ns
Physical characteristics						
Weight before pregnancy	61.0 (56–68)	63 (57–69)**	63.5 (58–70.5)**	65.0 (57–72)*	62.0(57–68)ns	61.0 (56–68)ns
Weight increase in pregnancy	11.0 (8–13)	11 (8–14)ns	10.5 (8–13.5)ns	12 (9–14) ns	11 (9–13)ns	11(9–14)*
Smoking (%)	28	33/*	36/*	43/*	35/ns	27/ns
Height in cm	168 (163–172)ns	168 (164–172)ns	168 (163–172)ns	169 (165–173)ns	169 (165–172)*	168 (164–172)ns
BMI >30 (%)	4	5/ns	9/**	2/ns	4 ns	4/ns
Social conditions						
Social group 5 (no education)(%)	23	25/ns	37/***	21/ns	19/ns	22/ns
Psychosocial factors						
Daily stress level	2.1 (0.6–4.7)	2.9 (1.1–5.3)***	4.2 (1.3–7.0)***	2.0 (0.8–4.9)ns	3.1 (1.4–4.8)**	2.4 (0.9–4.8)ns
Work satisfaction	8.3 (6.7–9.6)	7.9 (5.4–9.2)***	7.4 (5–9)**	8.2 (7.7–8.9)ns	8.2 (7.7–8.9)ns	7.6 (5.3–9.3)***

% is the percentage of women with the risk factor, all other values are absolute values.
In case an increased risk factor the significance level is marked: ns, $p > 0.05$; *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

Table II. The risk factors still significant after the multivariate logistic regression analysis.

Variable	All pelvic pain $n=490$	Pelvic girdle syndrome $n=136$	Symphysiolysis $n=47$	One-sided sacroiliac syndrome $n=127$	Double-sided sacroiliac syndrome $n=180$
	OR/p value				
Previous history					
Low back pain	2.2/***	2.3/***	(1.8/0.07)	2.0/**	2.3/***
Trauma to the back	2.8/***	3.5/***	ns	2.3/**	2.5/***
Salpingitis previous year	ns	ns	ns	(2.0/0.06)	ns
Multiparae	2.2/***	3.5/***	2.7/**	ns	2.4/***
Physical characteristics					
Weight before pregnancy	ns	1.03/*	1.04/*	ns	ns
Weight increase in pregnancy	ns	ns	ns	ns	1.1/*
Smoking	ns	ns	2.2/*	ns	ns
Height	ns	ns	ns	1.05/*	ns
Social conditions					
Social group 5 (uneducated)	ns	ns	ns	0.5/*	ns
Psychosocial factors					
Daily stress level	1.1/**	1.2/***	ns	1.1/*	ns
Work satisfaction	0.9/**	0.9/*	ns	ns	0.9/**

() The 0.06+0.07 p values are significant in the univariate analysis but only borderline significant in the multivariate analysis.
All variables went into the multivariate logistic regression, for each syndrome except "experience of last delivery", as not all women delivered. This variable had a separate fit adjusting for all the others. ns, $p > 0.05$; $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

studies by O'Sullivan et al. (20) have expanded these theories to include the sacroiliac joints, and revealed that delayed activation of the "inner unit" is associated with pelvic girdle pain.

Only the three groups suffering from sacroiliac pain (pelvic girdle syndrome, one-sided sacroiliac syndrome, and double-sided sacroiliac syndrome) had a significantly higher frequency of previous trauma to the back or pelvis. Mechanical conditions aggravated by pregnancy (e.g. nonalignment of joints, problems with muscular balance, or changes in elastic tissue in consequence of trauma) could possibly cause or contribute to pain in the sacroiliac joint(s).

Among women with pelvic girdle syndrome and symphysiolysis as well as " all pelvic pain", we found a modestly higher weight at the start of pregnancy than among women in the "pelvic healthy" group. The findings in previous studies were not significant (11,12). Possibly our results are due to the modest OR (1.02–1.1 pr kg); these small differences could not reach significant differences in the relatively small study populations.

We found multiparae to be a generic risk factor, present in all groups except one-sided sacroiliac syndrome. This finding is in accordance with several other authors (2,11,12).

Østgaard et al. (21) discovered an increase in peripheral laxity in the finger joints both as pregnancy progressed and between primi- and multiparae women. The laxity in primiparous woman at week 36 was equivalent to the laxity in multiparous women at week 12 of pregnancy. But they did not discover any connection between increased laxity and back pain. It is a possibility that increased joint laxity is the pathogenic explanation, but this has never been confirmed.

A significantly higher frequency of salpingitis was seen in the one-sided sacroiliac syndrome group (this condition was recognized in this study only when diagnosed by a medical doctor and medically treated). Szanto (22) found sacroilitis verified by radiography and scintigraphy in 39 (68%) out of 57 women with salpingitis. During the physical examination of the women we observed a decreased mobility in one sacroiliac joint in 69% of women in the group with one-sided sacroiliac syndrome (21) as opposed to 0% in the symphysiolysis group. A possible causal relation could be a previous sacroilitis – resulting in adherences in the sacroiliac joint or surrounding tissue. These adherences reduce the mobility of one joint causing a "locked joint" or painful connective tissue. When the pregnancy is physically changing the body and the demands on the tissue and joints are increased, this otherwise silent problem is exposed. We believe this is a probable causal change, as the group of one-sided sacroiliac syndrome is the only group where we found significantly increased frequency of sacroilitis, and at the same time pain in only one joint together with "locked" sacroiliac joint by the objective tests (21).

Earlier theories concerning the hormone relaxin "hyper relaxing" influence on the connective tissue resulting in hypermobile painful joints also lead to theories concerning hormone treatment as a possible risk factor. We found that contraceptive pills taken in the last 6 months previous to pregnancy did not increase the risk of getting pelvic pain, which is confirmed by others (2,9), neither did the women who had *in vitro* fertilization or other hormone treatment to establish pregnancy have increased risks of any kind of pelvic girdle pain.

Conclusion

In this study we did not identified any *single* risk factor for developing any kind of pelvic girdle pain in pregnancy, but a set of physical and psychosocial factors was revealed and we have demonstrated that four different syndromes of pelvic girdle pain have different sets of risk factors. For all the women with pelvic pain the risk factors are: a history of previous low back pain, trauma of the back or pelvis, multiparae, higher level of stress, and job dissatisfaction.

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