Chapter
2

Back pain during and after pregnancy: Associations with biomedical, sociodemographic, behavioral, obstetrical and psychosocial factors

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Abstract

Background: While in general population a relation is found between (chronic) back pain and psychosocial factors, this has not been investigated thoroughly in pregnancy. During pregnancy, every second woman will experience some degree of back or pelvic pain. In addition to individual suffering, back pain is a major cause for sick leave and as a result, a large expense for society [13, 14]. Back pain during and after pregnancy appears to be multicausal and it requires better understanding. Reports describing the effect of psychosocial factors on the prevalence of back pain during pregnancy are scarce.

Methods: Longitudinal cohort study including 672 nulliparous women with a singleton low risk pregnancy. Participants received self-report questionnaires on biomedical, sociodemographic and behavioral factors as well as questions about depressive symptoms, quality of relation with her partner and personality at 12 and 36 weeks gestation and three and twelve months after delivery.

Results: The only constant predictive factor of back pain during and after pregnancy in all measurements was a history of back pain. Several other factors, including some psychosocial factors were statistically significant in logistic regression at some time during or after pregnancy.

Conclusion: The most predictive risk factor for back pain in and after pregnancy is history of back pain. We found no clear association between psychosocial factors and the occurrence of back pain during and after pregnancy.

Introduction

In a non-pregnant population there is ongoing research on the contribution of psychosocial factors to the occurrence and persistence of back pain [1-3].

During pregnancy, every second woman will experience some degree of back pain [4-10]. These women are less mobile, experience lower quality of life [11] and have problems with daily activities [12]. In addition to individual suffering, back pain is a major cause for sick leave and as a result, a large expense for society [13, 14]. Back pain during and after pregnancy appears to be multicausal and it requires better understanding. A history of back pain before pregnancy or in a previous pregnancy has been found to be an important risk factor for the occurrence of back pain during present pregnancy [4, 15-18]. Other biomedical, sociodemographic and behavioral risk factors including multiparity [4,8], young age [19,6,15], vocational conditions [5, 8,15,19], lack of exercise [19] and smoking [8,20,21] are mentioned but scientific evidence to the exact role is inconclusive [5,7,19].

Reports describing the effect of psychosocial factors on the prevalence of back pain during pregnancy are scarce. Rodriguez et al reported that the psychosocial factors that were associated with the prevalence of 27 pregnancy symptoms (including back pain), while controlling for biomedical factors, included perceived stress, and the lack of social support from friends and partner and two personality characteristics: negative affect and hostility [22]. Psychosocial factors could only explain a small percentage of the variance in pregnancy related complaints like fatigue, nausea and back pain in pregnancy in a study performed by Paarlberg et al [23]. However, in both studies back pain was only one of many examined complaints and data were limited to the pregnancy period.

Whether psychosocial factors contribute to back pain during and after pregnancy has not been assessed before. Therefore the aim of this study was to examine if psychosocial factors are associated with back pain during and after pregnancy in primigravid women in addition to biomedical, sociodemographic, behavioral and obstetrical factors.

Methods

This study is part of a prospective longitudinal cohort study concerning pelvic floor problems, sexuality and back pain during first pregnancy until one year after delivery.

Study population

Between January 2001 and July 2003 1366 nulliparous pregnant women from ten midwifery practices in an urban area in the center of The Netherlands were approached to take part in this prospective longitudinal cohort study. Inclusion criteria were a singleton low risk pregnancy between twelve and eighteen weeks gestation and sufficient knowledge of the Dutch language. All nulliparous pregnant women received information about the study from the midwives. After one week the women were approached by phone and asked if they wanted to participate in the study. One hundred and twenty-two women were excluded due to having a twin pregnan-

cy (n=2), miscarriage (n=13) or insufficient knowledge of the Dutch language [107]. Thus, 1244 women met the inclusion criteria. Of these 672 (54%) decided to participate in the study. The most common reasons for refusal were lack of time and the intensity and intrusiveness of the questions. The Medical Ethics Committee of the University Medical Center Utrecht approved the study. All participants signed an informed consent form.

Questionnaires
Self-report questionnaires were sent at 12 and 36 weeks gestation and three and 12 months after delivery containing questions about biomedical, sociodemographic, behavioral and psychosocial factors. To determine history of back pain, women were asked if they had visited a doctor prior to their pregnancy because of back pain. Whether women suffered from back pain in present pregnancy was established by the question "Do you suffer from back and/or pelvic pain at the present time?". If stated yes, the women were asked to indicate the location of the pain on a drawing. Only women who indicated the pain in the gray area as shown in figure 1 were considered to have back pain.
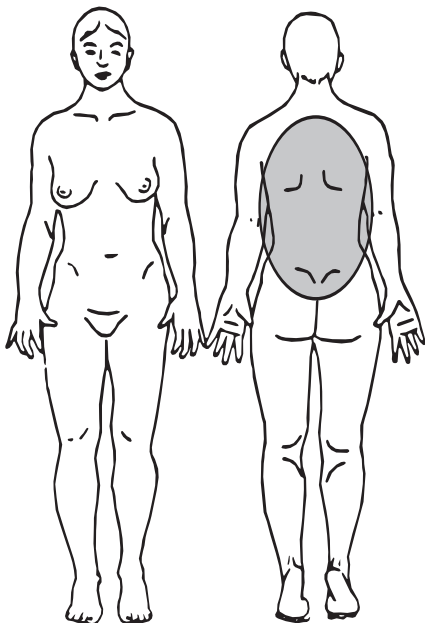
Figure 1 Only women who located pain in the gray area were considered to have back pain.

Psychosocial factors were studied using the following questionnaires. The Dutch Personality Questionnaire (DPQ) [24] contains 133 statements which are divided into seven domains: inadequacy, social inadequacy, rigidity, hostility, egoism, dominance and self esteem. The higher the score, the more these characteristics are part of

the subject's personality. The scales have different ranges from 0-30 to 0-50. Because personality is considered to be stable over time, this questionnaire is completed only once, at 24 weeks gestation.

The Center for Epidemiologic Studies Depression scale (CES-D) is developed for use in non-psychiatric populations and gives an impression of depressive symptoms and tendency towards depression [25, 26]. The total score ranges from 0 to 60; a higher score corresponds with more symptoms. A cut-off score of 16 is frequently used as an indication of a probable depression.

The Maudsley Marital questionnaire (MMQ) was used to measure the subjective emotional and sexual relationship of the woman with her partner [27]. The MMQ consists of 15 questions, of which 10 concern emotional and 5 concern sexual aspects of the relationship. Total scores of emotional (range 0-80) and sexual (range 0-40) items were compared in women with and without back pain. The higher the score, the worse this specific aspect of the relationship is perceived. In addition, questions were asked concerning biomedical, sociodemographic and behavioral variables. Education level was divided in high school or less and more than high school. In the Netherlands, midwives are responsible for providing primary obstetrical care of healthy pregnant women. If pregnancy-related problems occur, the obstetrician/gynecologist is consulted. Obstetrical data were obtained from involved midwives and obstetricians/gynecologists.

Statistical analysis

Sociodemographic data are summarized as mean (standard deviation) for continuous data and in percentages (numbers) for categorical data. Significant difference in point prevalence was determined using McNemar tests. Possible variables associated with back pain were compared in women with and without pain in univariate analysis using the Student's t-test for continuous and chi-square test for categorical variables. Multivariate

logistic regression analyses (stepwise forward method) were performed for variables statistically significant at $p<0.05$ level in univariate analyses. The presence or absence of back pain was used as the dependent variable. The potential associated factors were entered in two blocks: block 1 for biomedical, sociodemographic, behavioral and obstetrical factors and block 2 for psychosocial factors. Logistic analyses were also used to calculate estimated odds ratios (Exp(B)) for continuous variables significant at $p<0.05$ level. All analyses were performed with SPSS for Windows 11.5. The examined variables include the following: body mass index (BMI) at all measurements, change in BMI between the measurements, age, level of education, marital state, whether the women exercised, smoked or used alcohol, employment, whether the participant worked in a comfortable position and whether she was satisfied with her job, the presence of a chronic illness and the use of medication. Psychosocial variables included the seven domains of the DPQ, the two scales of the MMQ and a score of 16 or more on the CES-D. Additionally, obstetrical variables were examined in measurements three months after delivery: birth weight and gender of the infant, gestational date, duration of first and second stage, and condition of perineum, mode of delivery and use of epidural anesthetics during labor.

Results

Response rates
The personality questionnaire, sent at 24 weeks gestation, was answered by 642 (95%) of the women. The questionnaires at 36 weeks gestation and three and twelve months after delivery were answered by respectively 527 (78%), 503 (75%) and 509 (76%) women. Birth records were obtained from 501 (75%) of the participants.

Population characteristics
Sociodemographic, health related and obstetrical variables of the study population are shown in table 1. As mentioned before, the participants had low risk pregnancies; therefore major illnesses such as preexistent diabetes are not included. Half of the women with chronic illness in this study (11.8%) suffered from mild pulmonary disease (51.9%). The other half included illnesses such as soft tissue disease (12.7%), thyroid disease (10.1%), dermatological problems (11.4%) and miscellaneous (13.9%). One year after delivery, 12.6% (n=64) of the participants were pregnant again. These women are left out in all analyses at 12 months after delivery.

Prevalence of back pain
The percentage women who stated they had visited a physician because of back pain prior to the pregnancy was 31.3% (n=210). At gestational age of 12 weeks, 45.3% of the women reported having back pain. This percentage increased to 55.4% at 36 weeks gestation (p=0.00). After delivery the prevalence of back pain dropped to 31.9% and 29.9% at respectively three and twelve months post partum (p=0.00). Of all women 26.2% developed de novo back pain at 12 weeks and 17.1% de novo at 36 weeks gestation. Only 31.1% (n=164) of all women did not have back pain at any time in pregnancy. Of the women with back pain at 36 weeks gestation, 41.9% and 38.7% still suffered from back pain at respectively three and twelve months after delivery.

Analysis
Tables 2 to 5 show odds ratios with 95% confidence intervals of statistical significant differences in univariate analyses (crude odds ratio) and after logistic regression analyses (adjusted odds ratio) of women with and without back pain at all four measurements. History of back pain is a constant independent factor in all measurements (OR 1.66-2.98). In different measurements diverse factors like BMI at 36 weeks gestation (OR 1.06), reduction in BMI three months after pregnancy (OR 0.76), lack of exercise at twelve weeks gestation (OR 1.51) chronic illness at 36 weeks gestation (OR 1.97), use of medication twelve months after delivery (OR 2.23), more depressiveness three months after pregnancy (OR 2.10), dissatisfaction with the emotional relation with their partner and, lower self-esteem at twelve weeks gestation (OR 1.05 and OR 0.95 respectively) and feeling of inadequacy at 36 weeks gestation and twelve months after delivery (OR 1.05 and 1.07) were found to be statistical significant associated with back pain in multiple logistic regression analysis. Obstetrical variables were not significantly different in women with and without back pain.

Table 1. Population characteristics.

		mean	SD
Age at delivery (years)		30.3	3.9
Body mass index (kg/m^2)	m1	23.9	4.9
	m3	27.9	4.1
	m4	24.5	5.7
	m5	24	4.3
Body mass index increase (kg/m^2)	m3-m1	4.3	1.6
	m4-m3	3.6	1.5
	m5-m3	4.1	2.0
Duration of relationship (years)		6.9	4.0
Infant birth weight (grams)		3417	593
Second stage of labor (minutes)		58	39
Gestational age (days)		278.7	22.4
		N	**%**
First stage of labor	<6 hours	71	22.5%
	6-12 hours	138	43.7%
	12-24 hours	74	23.4%
	>24 hours	33	10.4%
Mode of delivery	spontaneous	330	66.4%
	instrumental	83	16.5%
	caesarean	85	17.1%
Perineal state after vaginal birth	no rupture	65	16.3%
	1st-2nd degree	118	29.5%
	3rd-4th degree	22	5.5%
	episiotomies	195	48.8%
Chronic illness	m1	79	11.8%
Educational level	high school or less	361	53.7%
	> high school	311	46.3%
Employment rate	m1	631	94.0%
	m4	385	76.5%
Smoking	m2	63	10.0%
	m5	71	16.1%
Use of alcohol	m2	89	14.2%
	m5	236	53.5%
Use of medication	m1	65	9.7%
	m3	84	16.0%
	m4	56	11.2%
	m5	49	11.1%

Values are expressed in mean (standard deviation) or number (percentage). m1 = 12 weeks gestation (n=672), m2 = 24 weeks gestation (n=642), m3 = 36 weeks gestation (n=527), m4 = 3 months postpartum (n=503), m5 = 12 months postpartum (n=445), obstetrical data (n=501).

Table 2. All women with and without back pain at 12 weeks gestation (n=672).

Associated factors		No back pain n=365	Back pain n=302	Crude odds ratio (95%CI)	Adjusted odds ratio (95% CI)
Measurements	Age	30.63 (3.57)	29.85 (4.21)	0.95 (0.91-0.99)	
Work/education	Lower education	46.4%	62.6%	1.93 (1.41-2.63)	
	Unemployed	3.3%	8.9%	2.90 (1.44-5.81)	
	Uncomfortable work	16.1%	25.6%	1.80 (1.21-2.66)	
	Unsatisfied	5.4%	11.0%	2.18 (1.20-3.95)	
Habits/medical	No physical exercise	44.4%	56.7%	1.64 (1.21-2.23)	1.51 (1.04-2.19)
	Smoking	6.4%	14.4%	2.46 (1.42-4.24)	
	History of back pain	22.4%	41.7%	2.48 (1.77-3.47)	2.23 (1.51-3.29)
Depressive symptoms	CES-D total	7.94 (6.57)	11.10 (8.30)	1.06 (1.04-1.08)	
Marital scale	Emotionality	7.16 (6.58)	10.47 (8.60)	1.06 (1.04-1.09)	1.05 (1.02-1.07)
	Sexuality	7.77 (5.85)	8.77 (6.26)	1.03 (1.00-1.05)	
Personality	Inadequacy	8.23 (5.75)	11.10 (7.05)	1.07 (1.05-1.10)	
	Social Inadequacy	6.73 (6.10)	8.43 (6.86)	1.04 (1.02-1.07)	
	Hostility	12.53 (5.56)	14.65 (6.80)	1.06 (1.03-1.09)	
	Egoism	8.82 (4.30)	10.02 (4.80)	1.06 (1.02-1.10)	
	Self esteem	30.66 (4.55)	28.46 (5.19)	0.91 (0.89-0.94)	0.95 (0.91-0.99)

Only items with significance level of p< 0.05 are shown. Values of associated factors are expressed in percentage or mean (standard deviation). Odds Ratios are given with 95% confidence interval (95% CI). CES-D: Center for Epidemiologic Studies Depression scale. Explained percentage in multiple logistic analysis is 15.5%

Table 3. All women with and without back pain at 36 weeks gestation (n=527).

Associated factors		No back pain n=232	Back pain n=288	Crude odds ratio (95%CI)	Adjusted odds ratio (95% CI)
Measurements	Body mass index	27.24 (3.60)	28.48 (4.36)	1.08 (1.03-1.14)	
Habits/medical	No physical exercise	66.2%	74.6%	1.50 (1.02-2.19)	
	Chronic disease	6.6%	13.10%	2.17 (1.16-4.06)	2.07 (1.06-4.07)
	Use of alcohol	18.1%	10.6%	0.54 (0.32-0.89)	
	History of back pain	23.5%	35.71%	1.81 (1.23-2.67)	
Depressive symptoms	CES-D total	8.65 (6.84)	11.63 (7.82)	1.06 (1.03-1.09)	1.69 (1.10-2.60)
Personality	Inadequacy	8.31 (5.86)	10.51 (6.77)	1.06 (1.03-1.09)	1.05 (1.02-1.08)
	Social Inadequacy	6.93 (6.46)	8.18 (6.56)	1.04 (1.00-1.06)	
	Hostility	12.77 (6.09)	13.94 (6.23)	1.03 (1.00-1.06)	
	Self esteem	30.19 (4.72)	29.08 (5.10)	0.96 (0.92-0.99)	

Only items with significance level of $P < 0.05$ are shown. Values of associated factors are expressed as percentages or means (standard deviation). Odds Ratios are given with 95% confidence interval (95% CI). CES-D: Center for Epidemiologic Studies Depression scale. Explained percentage in multiple logistic analysis is 12.1%.

Table 4. All women with and without back pain at 3 months after delivery (n=503).

Associated factors		No back pain n=342	Back pain n=160	Crude odds ratio (95%CI)	Adjusted odds ratio (95% CI)
Measurements	BMI (m4-m3)	-3.49 (1.14)	-3.95 (1.82)	0.77 (0.64-0.93)	0.77 (0.63-0.93)
Work/education	No work at 3 months	19.9%	31.3%	1.83 (1.20-2.81)	1.85 (1.06-3.18)
Habits/medical	History of back pain	24.9%	46.5%	2.62 (1.76-3.90)	2.50 (1.55-4.02)
Depressive symptoms	CES-D total	7.54 (7.56)	10.00 (8.62)	1.04 (1.01-1.06)	1.05 (1.02-1.08)
Marital scale	Emotionality	9.46 (8.82)	12.46 (11.20)	1.03 (1.01-1.05)	
Personality	Inadequacy	8.55 (6.11)	10.99(6.68)	1.06 (1.02-1.09)	
	Social Inadequacy	6.98 (6.36)	8.42 (6.89)	1.03 (1.01-1.06)	

Only items with significance level of p< 0.05 are shown. Values of associated factors are expressed in percentages or means (standard deviation). Odds Ratios are given with 95% confidence interval (95% CI). BMI-m4-m3: body mass index reduction between 36 weeks gestation and 3 months after delivery. Explained percentage in multiple logistic analysis is 13.0%.

Table 5. All non-pregnant women with and without back pain at 12 months after delivery (n=445).

Associated factors		No back pain n=312	Back pain n=133	Crude odds ratio (95%CI)	Adjusted odds ratio (95% CI)
Measurements	Body mass index	23.69(4.08)	24.79(5.48)	1.06 (1.01-1.11)	
Habits/medical	Use of medication	8.1%	18.0%	2.49 (1.37-4.55)	2.07 (1.05-4.08)
	History of back pain	24.7%	48.9%	2.92 (1.90-4.49)	3.02 (1.90-4.82)
	Smoking	13.6%	21.8%	1.77 (1.05-2.98)	
Depressive symptoms	CES-D total	6.12(7.20)	10.08(9.09)	1.06 (1.03-1.09)	
Marital	Emotionality	10.93(9.70)	14.96(12.49)	1.03 (1.01-1.05)	
	Sexuality	8.66(6.43)	10.12(7.10)	1.03 (1.00-1.06)	
Personality	Inadequacy	8.54(6.08)	11.81(6.75)	1.08 (1.05-1.12)	1.05 (1.01-1.09)
	Social Inadequacy	7.02(6.52)	8.98(6.62)	1.05 (1.01-1.08)	
	Self esteem	30.37(4.82)	28.09(5.27)	0.92 (0.88-0.95)	0.95 (0.90-1.00)

Only items with significance level of p< 0.05 are shown. Values of associated factors are expressed in percentages or means (standard deviation). Odds Ratios are given with 95% confidence interval (95% CI). CES-D: Center for Epidemiologic Studies Depression scale. Explained percentage in multiple logistic analysis is 16.9%.

Discussion

In this prospective longitudinal cohort study examining factors associated with the prevalence of back pain during and after pregnancy in primiparous women, we found that the only variable that remained significantly associated with the presence of back pain in all measurements was history of back pain. The association of back pain with psychosocial factors was not clear. Some examined factors were found to be independently associated with back in logistic regression models, but not consistently in all measurements.

Obstetrical variables were not associated with the occurrence of back pain.

The prevalence of back pain in general and back pain in pregnancy found in our study is similar to that in other studies [4, 5, 7-10, 15, 21, 28], as well as the drop in prevalence after delivery [9, 21, 28, 29].

Associated factors
Depressive symptoms
We found an overall percentage of 20.7% of women who scored 16 or higher on the CES-D, indicating a probable depression at 36 weeks gestation. In a large study (n=3472) using the CES-D in pregnancy a similar percentage (20%) was found (30). Women with back pain at three months after delivery were more likely to have a probable depression (OR=2.10) as compared to those without back pain. It is not clear whether back pain is the cause or the result of depressive symptoms. It is likely that the two problems reinforce each other.

Marital satisfaction
We found an inverse association between back pain and the quality of the emotional relationship of the woman with her partner early in pregnancy, but not in later measurements. There was no independent association between back pain and sexual satisfaction. We found no association between marital status and back pain. Married adults in the general population are reported to have less back pain and better general health than other marital status categories [31,32]. An association between marital dissatisfaction, problems in interpersonal relations and sexual problems with back pain is reported in non-pregnant women [33, 34]. We could not verify this in pregnancy.

Personality
A lower self-esteem and feeling inadequate was at different measurements during and after pregnancy associated with back pain, but again, not consistently. Feelings of inadequacy and low self-esteem are considered to be an indication of a neurotic personality [34]. An association between neuroticism and back pain, especially in its chronic form, is reported [35, 36].

Biomedical Factors

In this study was found that a history of back pain is the most important factor for reporting back pain during and after pregnancy: a consistently reported finding in other studies as well [7, 9, 16, 19, 29, 37]. However data on other biomedical factors are conflicting. Higher weight and lower age are reported to be associated with back pain [4, 7, 9, 38]. We did not find an independent association with age; we did find a higher BMI in women with back pain, but only at 36 weeks gestation. This is probably why these women lost more weight after delivery than women without back pain.

Sociodemographic factors

After correction for other associated factors, no consistent associations were found between back pain and educational level or vocational conditions. There has been done a vast amount of research regarding work environment.

Behavioral factors

Early in pregnancy, women who did not exercise reported more back pain. At 36 weeks gestation, in univariate analysis, lack of exercise was also associated with back pain, but in multivariate logistic regression analysis, this was not an independent factor predicting back pain. After delivery the presence of back pain is not influenced by physical exercise. In literature, there is no consensus on this subject. An inverse association between exercise or strong muscles and back pain in a non-pregnant population is reported [39-41], but in most studies on back pain in pregnancy exercise is not an associated factor [5,11,37].

A relation between smoking and back pain is reported in pregnant and non-pregnant women and men [8,20,21,42,43] but a causal relationship is doubtful [43]. We did not observe this relationship. This may be due to the fact that during pregnancy many women quit smoking.

Because above-mentioned factors were statistical significant at some time during or after pregnancy but not in all measurements, these findings have to be interpreted with vigilance. If any association exists, it is best to consider this as weak.

The strength of this study is that we used a prospective, longitudinal cohort design with standardized questionnaires in healthy nulliparous women. Due to the intimate nature of other questions on sexuality and pelvic floor discomfort the response rate was but 54%. However, rate of back pain are similar to studies with higher response rates [5, 7, 8, 9, 15, 21, 28] and the obstetrical outcome of the study population was identical to that of comparable women registered in the Netherlands Perinatal Registry 2001 [44]. Therefore we consider this is a representative sample of the normal pregnant population.

Since back pain is primarily a subjective symptom we used self report questionnaires and no physical tests. In previous studies there was a significant correlation between self reported back pain and clinical findings [45, 46].

Conclusion

The prevalence of back pain almost doubles in pregnancy. A history of back pain was the only constant predictive factor of back pain during and after pregnancy. There was no clear association between psychosocial factors and back pain during and after pregnancy. We found no other constant factor that could be accountable for the additional back pain that occurs in pregnancy. Most likely pregnancy itself, with the different aspects of each trimester, is responsible for the added prevalence of back pain in pregnancy.

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