



# The influence of psychosocial factors on pregnancy related pelvic symptoms

Geerte van de Pol

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De invloed van psychosociale factoren op zwangerschapsgerelateerde bekkenklachten

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De invloed van psychosociale factoren op zwangerschapsgerelateerde bekkenklachten

(met een samenvatting in het Nederlands)

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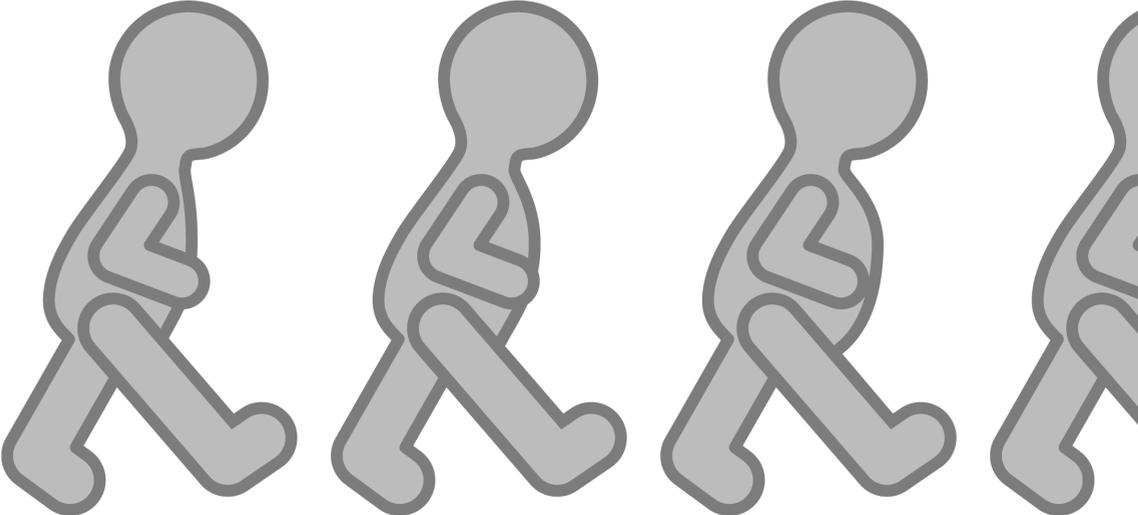


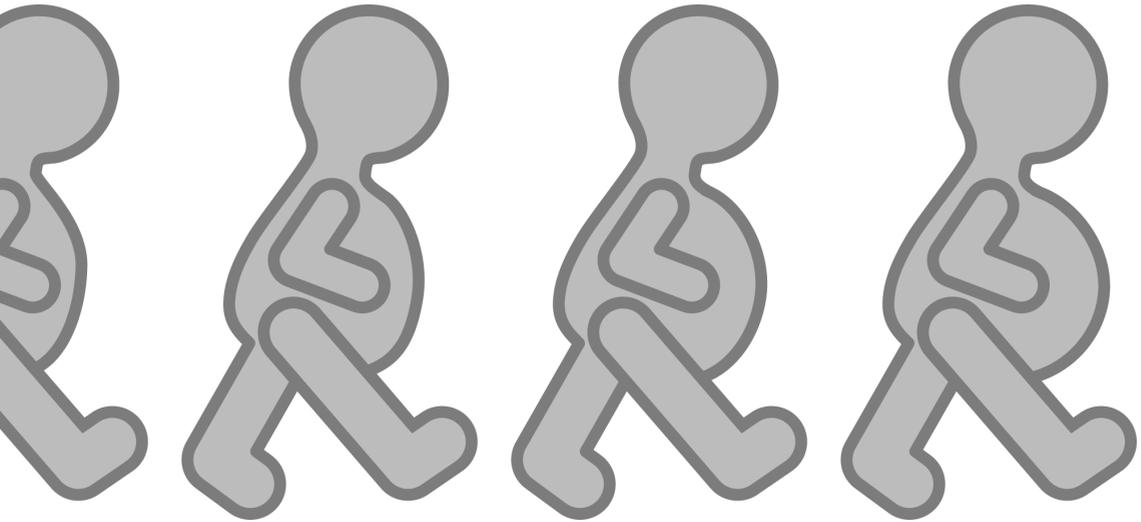
## Contents

<b>Chapter 1</b>	General Introduction	11
	<b>Section 1</b>	
<b>Chapter 2</b>	Back pain during and after pregnancy: Associations with biomedical, sociodemographic, behavioral, obstetrical and psychosocial factors. Submitted	27
<b>Chapter 3</b>	The Pregnancy Mobility Index: A mobility scale during and after pregnancy. Acta Obstetricia Gynecologica Scandinavica 2006;85(7):786-91.	43
<b>Chapter 4</b>	Pregnancy related pelvic girdle pain in the Netherlands. Submitted	55
	<b>Section 2</b>	
<b>Chapter 5</b>	Psychosocial factors and mode of delivery Journal of Psychosomatic obstetrics and gynecology. 2006, in print	71
	<b>Section 3</b>	
<b>Chapter 6</b>	Is there an association between depressive and urinary symptoms during pregnancy? Submitted	85

	<b>Section 4</b>	
<b>Chapter 7</b>	General Discussion	101
<b>Chapter 8</b>	Summary	113
<b>Appendices</b>		
	I. Nederlandse Samenvatting	119
	II. Questionnaires - Vragenlijsten	123
	Center for Epidemiologic Studies Depression Scale	
	Dutch Personality Questionnaire (Nederlandse Persoonlijkheds Vragenlijst)	
	Maudsley Marital Questionnaire	
	Pregnancy Mobility Index	
	Urogenital Distress Inventory	
	III. Abbreviations	131
	IV. List of co-authors	133
	V. Dankwoord	135
	VI. Curriculum Vitae	139
	VII. List of publications	141







# Chapter 1

## General introduction

## Introduction

Pregnancy and childbirth are one of the most dramatic events in many women's lives. The body undergoes profound changes during this stage, which is sometimes accompanied with physical and psychosocial problems. First pregnancy is the transition of a woman to motherhood. This is usually a time of great joy, but a time of uncertainty and reflection as well. The relationship between the pregnant woman and her partner changes both emotionally as sexually, and there might be uncertainties and fear regarding the delivery, motherhood and future responsibilities.

Psychosocial and socioeconomic factors have been identified as possible contributors to the expression and maintenance of diseases. In different fields of human medicine evidence is presented on the relationship of chronic stress, low socioeconomic status, personality traits, depression, work stress and low social support on the cause and course of disease, such as coronary artery and gastrointestinal disease.<sup>1, 2</sup> In obstetrics, studies of the association between social support and pregnancy outcomes indicate that poor social support is associated with preterm birth and low birth weight.<sup>3</sup> In addition, evidence is found that maternal stress, depressive symptoms and anxiety are associated with preterm birth and low birth weight.<sup>4-6</sup> Neuroendocrine, immune, inflammatory and vascular pathways are suggested to explain these associations.<sup>7</sup> The association of psychosocial factors and mode of delivery is not clear. The association of psychosocial factors with pregnancy related problems was examined by Rodriguez et al.<sup>8</sup> They found an independent contribution of psychosocial variables to the prevalence and frequency of 27 pregnancy related symptoms. However, the impact of these variables on separate symptoms is not clear. Paarlberg et al only found a low predictive value of psychosocial factors for the occurrence of pregnancy-related symptoms (fatigue, nausea and back pain).<sup>9</sup>

All data analyzed in this thesis are obtained through the PRIMIS study, in which besides pregnancy related physical problems, psychosocial factors were examined. Validated questionnaires were used to assess depressive symptoms, the quality of the relationship of the women with her partner, and personality. In addition, data concerning employment, job satisfaction, marital status and educational level were collected. This database provides an unique opportunity to assess psychosocial factors and the interaction with physical problems, which is understudied in pregnancy. The investigation of this interaction could lead to improved understanding of pregnancy related health and health care issues. In the studies reported in this thesis, we assess the association between psychosocial factors and some pregnancy related symptoms and childbirth. Regarding pregnancy related symptoms, we focused on back and pelvic girdle pain, depressive symptoms, and urinary problems because they all are highly prevalent during pregnancy.

In the first section, we examined pregnancy related back and pelvic girdle pain and assessed possible associated psychosocial factors. In addition, we constructed and validated a questionnaire assessing mobility in relation to pregnancy related back and pelvic girdle pain. In the second section, we examined the relationship between psychosocial factors and the risk of instrumentally assisted delivery or

emergency cesarean section. In the last section, we assessed the association between depressive symptoms and urinary symptoms.

## PRIMIS Study

All analyses described in this thesis are separate analyses of data collected in the PRIMIS study. In the PRIMIS study a cohort of women was followed up from early pregnancy to one year after delivery. Urogenital and defecatory symptoms, general and disease specific quality of life, coping strategies, emotional and sexual quality of the relationship with the partner, personality and pregnancy related back and pelvic girdle pain were assessed at several points in time during and after pregnancy. The study was designed as a nested case-control study, in which women who reported symptoms were classified as cases and women without these symptoms as controls.

In the Netherlands pregnancy and delivery are considered physiological events. Therefore, healthy gravidae are monitored by midwives or general practitioners. If prior to or during pregnancy or parturition a medical problem occurs, the woman is referred to a gynecologist/obstetrician. We investigated healthy primiparous women, not biased by previous deliveries or diseases, because they represent the best clinical model. Nulliparous women were recruited through ten midwifery practices in the center of the Netherlands. Consequently, all women were initially healthy with a normal singleton pregnancy. If referral to a gynecologist/obstetrician was necessary after recruitment, the participant remained in the study. Birth records were obtained from the midwives and the gynecologists/obstetricians. Exclusion criteria were a history of pelvic surgery, a gestational date of more than 18 weeks, and insufficient knowledge of the Dutch language. The Medical Ethics Committee of the University Medical Center Utrecht approved the study. All participants signed an informed consent.

## Section 1

### *Pregnancy-related back and pelvic girdle pain*

In this section, containing three chapters, we examined the prevalence of pregnancy related back and pelvic girdle pain and assessed possible associated psychosocial factors. In addition, we constructed and validated a questionnaire assessing mobility in relation to pregnancy related back and pelvic girdle pain. First, an overview of previous studies on pregnancy related back and pelvic girdle pain is provided.

### *Terminology and definitions*

The terminology and definitions used for back and pelvic girdle pain associated with pregnancy differ between researchers and countries. This complicates comparing these studies. Terminology is based on location of pain, assumed pathological mechanism or time at which the pain occurs. Some of the terminology used is the following: peripartum pelvic pain,<sup>10</sup> symptom-giving pelvic girdle relaxation,<sup>11</sup> posterior pelvic pain,<sup>12</sup> pregnancy related back and pelvic pain,<sup>13</sup> and pelvic insta-

bility.<sup>14</sup> Definitions also vary considerably. Especially the distinction between back and pelvic pain is complicated. In The Netherlands, the lay press has given a lot of attention to pregnancy related pelvic girdle pain, and the term pelvic instability is since widely used by lay people. The term pelvic instability is applied for pain in the area of the anterior and posterior pelvic girdle, sometimes radiating to the perineal area and the lower extremities. The use of the term pelvic instability implies that instability of the pelvic joints is the cause of the symptoms. However, the degree of instability is not correlated to the severity of symptoms.<sup>13</sup> Therefore, we do not support the term pelvic instability as this suggests a pathophysiologic background that is not correct. However, this term is very commonly used in the Netherlands by lay people, and data on prevalence and consequences lack. We therefore specifically investigated self-reported pelvic instability. For the remaining research, we adopted the terms pregnancy related back pain and pregnancy related pelvic girdle pain as proposed by Wu et al, as they describe the presentation of the problem and do not assume any pathophysiologic background.<sup>15</sup> Assessing prevalence rates is complicated, as they are sensitive to terminology used, definitions and study population. Generally however, prevalence rates during pregnancy are estimated at 45% for back pain and 25% for pelvic girdle pain.<sup>15</sup>

### *Signs and symptoms*

Pain patterns in pregnancy related back and pelvic girdle pain vary widely, both within patients and between patients, and type and location of pain can change over time.<sup>15</sup> Symptoms are often quite mild but occasionally very severe and cause of serious disability.<sup>16, 17</sup>

### *Diagnosis and tests*

Pregnancy-related back and pelvic girdle pain are subjective symptoms and diagnosis is mainly based on self-reported data. While some specialized physiotherapist use biomechanical tests to investigate the severity of the symptoms, e.g. the active straight leg raise,<sup>18</sup> there are no validated questionnaires to assess disability caused by back and pelvic girdle pain during pregnancy. In the general population however, several validated self-report questionnaires have proven to be useful in assessing disability and loss of mobility caused by back pain and in evaluating treatment. Some of these questionnaires are used in pregnant populations.<sup>19-21</sup> However, a pregnant population not only differs from the general population regarding the type of back pain –frequently a pelvic girdle component is added- but pregnant women also have different mobility patterns and expectations. A reliable and valid instrument to assess the effect of both back and pelvic girdle pain during and after pregnancy on day-to-day activities is essential to evaluate treatment methods and will also help understanding normal mobility levels in pregnancy.

### *Pathofysiology*

Several etiologic mechanisms have been suggested for pregnancy related back and pelvic girdle pain, but none have been confirmed. One explanation is that increase in load on the spine and pelvis due to increased weight of the woman and

weight of the uterus causes pain.<sup>22</sup> However, several studies did not confirm the association between weight gain during pregnancy and fetal weight with back and pelvic girdle pain.<sup>23-25</sup> Another possible explanation for lower back pain in pregnancy is connective tissue microtrauma due to surmenage caused by different stature, e.g. increased lumbar lordosis. Ostgaard found in a series of biomechanical tests that although a large lumbar lordosis pre-pregnancy was a risk factor for developing back pain, lordosis did not increase during pregnancy.<sup>23</sup> The only biomechanical parameter that was weakly correlated with back pain was the abdominal sagittal diameter. The hormone relaxin, produced in the corpus luteum and the decidua, has been given a fair amount of attention. It was suggested that high levels of relaxin increases joint laxity and widening of the symphysis pubis, causing pregnancy related back and pelvic girdle pain.<sup>26</sup> However, more recent studies did not show any association between serum relaxin levels and the degree of symphyseal distention or pelvic girdle pain in pregnancy.<sup>27</sup> Also, no association has been found between degree of distention and severity of pelvic girdle pain.<sup>13</sup> In sum, the exact etiology of pregnancy related back and pelvic girdle pain is still unknown.

### *Risk factors*

Several risk factors are found to contribute to the occurrence of pregnancy related back and pelvic girdle pain. 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.<sup>25, 28-30</sup> Other biomedical, sociodemographic and behavioral risk factors including multiparity, age, weight, vocational conditions, lack of exercise and smoking are mentioned in literature but to date, there is no consensus about their impact.<sup>25, 31-39</sup> Consensus is also lacking concerning associated factors with pregnancy related pelvic girdle pain.<sup>15</sup> It is assumed that obstetric factors are not associated with this condition, although some data exists pointing in the opposite direction.<sup>10, 40</sup> In a non-pregnant population there is ongoing research on the contribution of psychosocial factors to the occurrence and persistence of back pain.<sup>41-43</sup> Whether these factors are of importance in the occurrence of pregnancy related back and pelvic girdle pain has not been investigated sufficiently.

### *Consequences*

Women suffering from pregnancy related back and pelvic girdle pain are less mobile, experience lower quality of life and have problems with daily activities.<sup>10, 44</sup> In addition to individual suffering, back pain is a major cause for sick leave and as a result, a large expense for society.<sup>45, 46</sup>

### *Treatment and prevention*

The evaluation of back and pelvic girdle pain treatment and prevention programs is challenging. Partly due to the heterogeneity and the varying quality of involved studies, no strong evidence has been found concerning the effect of physical therapy on the prevention and treatment of pregnancy related back and pelvic girdle pain.<sup>47</sup> Nevertheless, physiotherapy is widely used in pregnancy related back and pelvic girdle pain, both during and after pregnancy. There is no consensus on the posi-

ve effect of a pelvic belt.<sup>48, 49</sup> In their review, Young et al found that water gymnastics, specially shaped pillows, physiotherapy and acupuncture may reduce back and pelvic girdle pain.<sup>50</sup> In conclusion, treatment and especially prevention of pregnancy-related back and pelvic girdle pain needs further improvement.

## Section 2

A growing body of empirical evidence based on prospective studies shows that psychosocial factors such as social support, maternal stress, depressive symptoms and anxiety, significantly increase the risk for preterm birth and low birth weight.<sup>3-6</sup> Neuroendocrine, immune, inflammatory and vascular pathways are suggested to explain these associations.<sup>7</sup>

Data on psychosocial factors during pregnancy and mode of delivery are scarce. Because emergency cesarean and instrumental vaginal birth impose greater physical and emotional morbidity and increased mortality on both mother and infant than normal vaginal delivery, it is important to identify factors that are associated with the risk of assisted delivery.<sup>51-53</sup> In previous investigations, associations have been found between certain maternal and fetal factors with operative delivery, however, the impact of psychosocial factors is not clear.<sup>54-61</sup> In animal studies, stress – such as attendance of observers and unknown sounds – has been found to delay parturition.<sup>62</sup> Similarly, in humans, trait anxiety appears to be related with prolonged labor.<sup>63</sup> Whether symptoms of depression could hamper delivery is not clear as reports on the association of depressive symptoms and the need for operative delivery are conflicting.<sup>64-66</sup> Continuous support by a lay woman (doula) during labor and delivery facilitates birth, and significantly reduces many forms of medical intervention, including caesarean delivery and instrumental vaginal birth.<sup>67</sup>

## Section 3

In the last section of this thesis we assessed depressive symptoms and the possible association with urinary symptoms. Depressive symptoms are highly prevalent in pregnancy, and etiology is not clear.<sup>68</sup> Depression can have serious consequences, not only for the women experiencing it, but also for her child and family. Antenatal depression has been found to be a risk factor for adverse maternal and neonatal pregnancy outcomes.<sup>65</sup> Many associated biomedical, behavioral, socioeconomic and psychosocial factors have been identified both in a pregnant population as in the general population. Moreover, in the general population a strong association is reported between depression and urinary symptoms, such as urinary incontinence and overactive bladder syndrome.<sup>69-73</sup> Several explanations have been suggested for this association, among which a mutual etiology caused by low serotonin levels.<sup>69, 74</sup> While urogenital symptoms are more prevalent in pregnant than in non-pregnant women, the association of depressive and urinary symptoms has not yet been assessed in pregnancy.<sup>75</sup>

### *Aims of the thesis*

The issues, discussed above, led to the several conclusions. Firstly, possible associations of psychosocial factors with pregnancy related back and pelvic girdle pain and with mode of delivery need further investigation. Furthermore, data lack on the Dutch situation regarding so-called pelvic instability, and a validated scale to assess mobility in relation to back and pelvic girdle pain is required to further explore these symptoms and assess treatment. Finally, the association between depressive and urinary symptoms is not been investigated in pregnancy yet, although knowledge about this association might provide treatment opportunities.

More specifically, the objectives of presented analyses were:

1. To investigate the association of pregnancy related back and pelvic girdle pain with psychosocial factors,
2. To construct and validate a mobility measurement for pregnant women suffering from back and pelvic girdle pain,
3. To assess the Dutch prevalence, associated factors and consequences of so-called pelvic instability in a healthy pregnant population in the Netherlands,
4. To investigate the association of mode of delivery after spontaneous onset of labor with psychosocial factors,
5. To assess the association of depressive and urinary symptoms in pregnancy.

### *Outline of the thesis*

*Chapter 2* describes the prevalence and risk factors of back pain during and after pregnancy. A cohort of nulliparous women with a singleton low risk pregnancy. 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. Women who reported back pain were compared to women without back pain. In a multivariate logistic regression model independent associated factors with back pain were identified.

In *Chapter 3* we present a self-report mobility scale specifically designed for a pregnant population: the Pregnancy Mobility Index (PMI). The PMI consists of items concerning day-to-day activities selected through literature research and clinical experience. Participating women completed the questionnaire at 12 and 36 weeks gestation and one year after delivery. Reliability, construct and criterion validity were tested. As described above, we do not support the term pelvic instability as this suggests a pathophysiologic background that is not correct. However, this term is still commonly used in the Netherlands by women suffering from pregnancy related pelvic pain. It is unclear how many women feel they have pelvic instability, and data on consequences lack. We therefore specifically investigated self-reported pelvic instability in *Chapter 4*. Possible associated psychosocial and delivery-related factors were identified in multivariate logistic regression. Consequences of self-reported pelvic girdle pain during and after pregnancy, such as disability and sick leave were also addressed.

The prevalence of depressive symptoms, dry overactive bladder (OAB) syndrome and urge and stress urinary incontinence (UUI and SUI) during and after first preg-

nancy are reported in *Chapter 5*. We assessed these prevalence rates using two validated questionnaires regarding urinary and depressive symptoms. In addition we investigated the association of depressive symptoms with urinary incontinence and dry overactive bladder syndrome, controlling for confounding socioeconomic, psychosocial, behavioral and biomedical factors.

In *Chapter 6* we examined what factors are associated with the risk for instrumental and surgical delivery. We assessed healthy nulliparous pregnant women with a child in vertex presentation and spontaneous onset of term labor using validated questionnaires. In addition to biomedical and fetal factors we included psychosocial factors such as depressive symptoms, quality of the relationship of the woman with her partner, personality, lifestyle and educational level.

*Chapter 7* contains the general discussion and recommendations for clinical management and future research.

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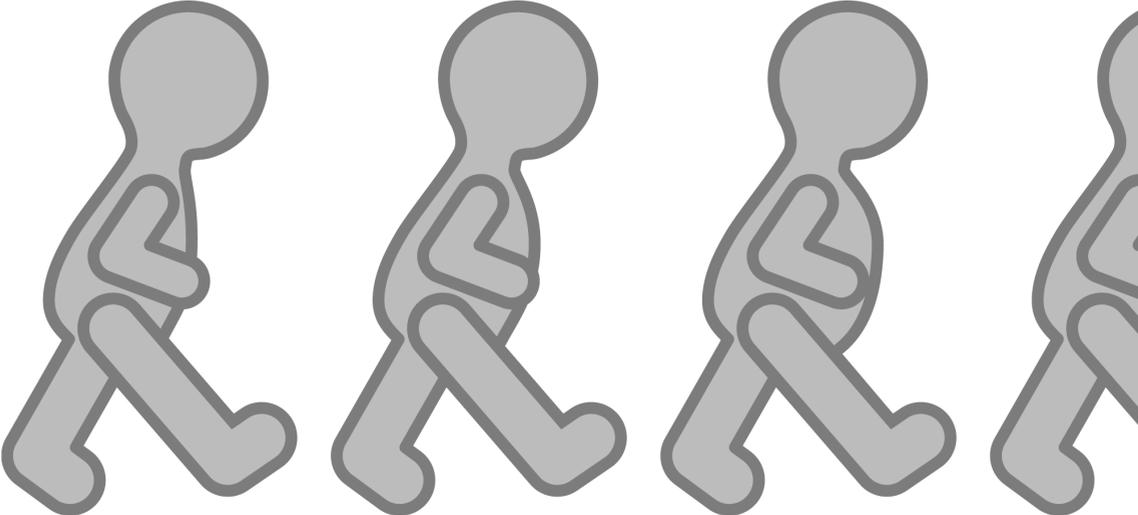
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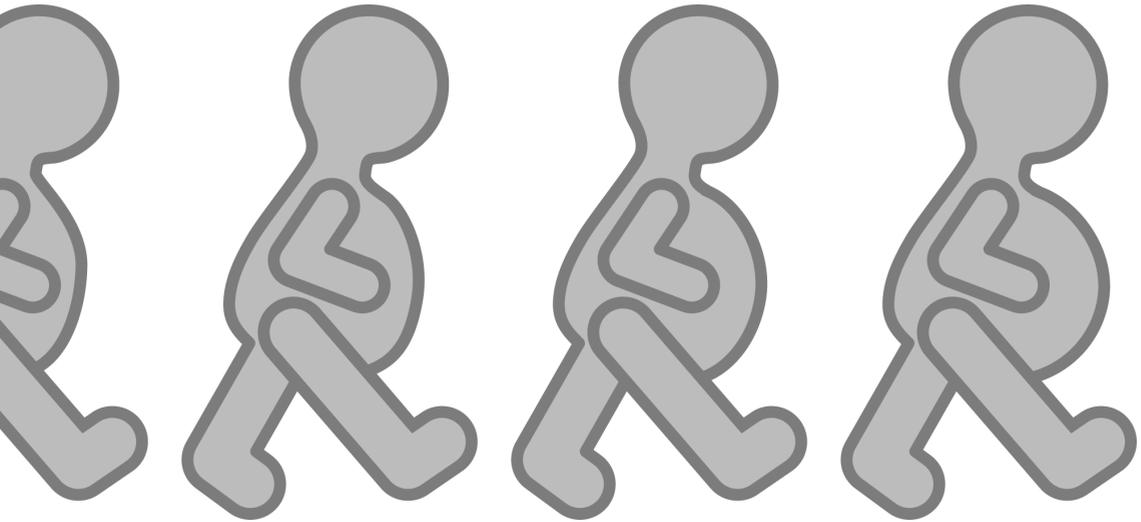
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## **Section 1**





## 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<sup>13,14</sup>. 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 <sup>1-3</sup>.

During pregnancy, every second woman will experience some degree of back pain <sup>4-10</sup>. These women are less mobile, experience lower quality of life <sup>11</sup> and have problems with daily activities <sup>12</sup>. In addition to individual suffering, back pain is a major cause for sick leave and as a result, a large expense for society <sup>13,14</sup>. 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 <sup>4,15-18</sup>. Other biomedical, sociodemographic and behavioral risk factors including multiparity <sup>4,8</sup>, young age <sup>19,6,15</sup>, vocational conditions <sup>5, 8,15,19</sup>, lack of exercise <sup>19</sup> and smoking <sup>8,20,21</sup> are mentioned but scientific evidence to the exact role is inconclusive <sup>5,7,19</sup>.

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 <sup>22</sup>. 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 <sup>23</sup>. 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.

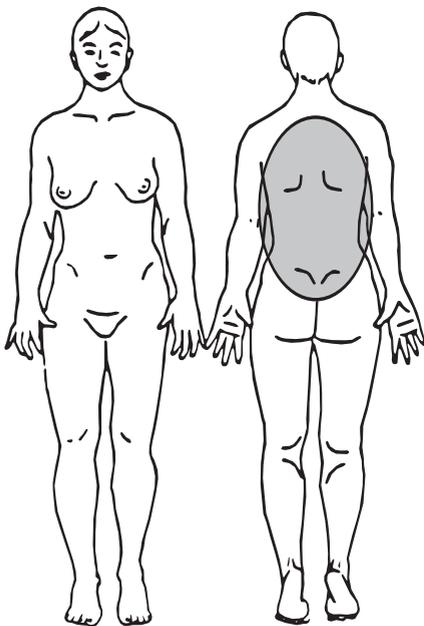
### *Study population*

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 <sup>107</sup>. 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) <sup>24</sup> 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<sup>25,26</sup>. 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<sup>27</sup>. 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.*

		<b>mean</b>	<b>SD</b>
<b>Age at delivery (years)</b>		30.3	3.9
<b>Body mass index (kg/m<sup>2</sup>)</b>	m1	23.9	4.9
	m3	27.9	4.1
	m4	24.5	5.7
	m5	24	4.3
<b>Body mass index increase (kg/m<sup>2</sup>)</b>	m3-m1	4.3	1.6
	m4-m3	3.6	1.5
	m5-m3	4.1	2.0
<b>Duration of relationship (years)</b>		6.9	4.0
<b>Infant birth weight (grams)</b>		3417	593
<b>Second stage of labor (minutes)</b>		58	39
<b>Gestational age (days)</b>		278.7	22.4
		<b>N</b>	<b>%</b>
<b>First stage of labor</b>	<6 hours	71	22.5%
	6-12 hours	138	43.7%
	12-24 hours	74	23.4%
	>24 hours	33	10.4%
<b>Mode of delivery</b>	spontaneous	330	66.4%
	instrumental	83	16.5%
	caesarean	85	17.1%
<b>Perineal state after vaginal birth</b>	no rupture	65	16.3%
	1st-2nd degree	118	29.5%
	3rd-4th degree	22	5.5%
	episiotomies	195	48.8%
<b>Chronic illness</b>	m1	79	11.8%
<b>Educational level</b>	high school or less	361	53.7%
	> high school	311	46.3%
<b>Employment rate</b>	m1	631	94.0%
	m4	385	76.5%
<b>Smoking</b>	m2	63	10.0%
	m5	71	16.1%
<b>Use of alcohol</b>	m2	89	14.2%
	m5	236	53.5%
<b>Use of medication</b>	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 painzn=302	Crude odds ratio (95%CI)	Adjusted odds ratio (95% CI)
<b>Measurements Work/education</b>	Age	30.63 (3.57)	29.85 (4.21)	0.95 (0.91-0.99)	
	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)	
<b>Habits/medical</b>	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)
	CES-D total	7.94 (6.57)	11.10 (8.30)	1.06 (1.04-1.08)	
<b>Depressive symptoms Marital scale</b>	Emotionality	7.16 (6.58)	10.47 (8.60)	1.06 (1.04-1.09)	
	Sexuality	7.77 (5.85)	8.77 (6.26)	1.03 (1.00-1.05)	1.05 (1.02-1.07)
<b>Personality</b>	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).

<b>Associated factors</b>	<b>No back pain n=232</b>	<b>Back pain n=288</b>	<b>Crude odds ratio (95%CI)</b>	<b>Adjusted odds ratio (95% CI)</b>
<b>Measurements</b>				
<b>Habits/medical</b>				
Body mass index	27.24 (3.60)	28.48 (4.36)	1.08 (1.03-1.14)	
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)	1.69 (1.10-2.60)
<b>Depressive symptoms</b>				
CES-D total	8.65 (6.84)	11.63 (7.82)	1.06 (1.03-1.09)	1.05 (1.02-1.08)
<b>Personality</b>				
Inadequacy	8.31 (5.86)	10.51 (6.77)	1.06 (1.03-1.09)	
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)
			pain n=342		pain n=160			
<b>Measurements</b>	BMI (m4-m3)		-3.49 (1.14)		-3.95 (1.82)		0.77 (0.64-0.93)	0.77 (0.63-0.93)
<b>Work/education</b>	No work at 3 months		19.9%		31.3%		1.83 (1.20-2.81)	1.85 (1.06-3.18)
<b>Habits/medical</b>	History of back pain		24.9%		46.5%		2.62 (1.76-3.90)	2.50 (1.55-4.02)
<b>Depressive symptoms</b>	CES-D total		7.54 (7.56)		10.00 (8.62)		1.04 (1.01-1.06)	1.05 (1.02-1.08)
<b>Marital scale</b>	Emotionality		9.46 (8.82)		12.46 (11.20)		1.03 (1.01-1.05)	
<b>Personality</b>	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)
			pain n=312		pain n=133			
<b>Measurements</b>	Body mass index		23.69(4.08)		24.79(5.48)		1.06 (1.01-1.11)	
<b>Habits/medical</b>	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)	
<b>Depressive symptoms</b>	CES-D total		6.12(7.20)		10.08(9.09)		1.06 (1.03-1.09)	
<b>Marital</b>	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)	
<b>Personality</b>	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<sup>4, 5, 7-10, 15, 21, 28</sup>, as well as the drop in prevalence after delivery<sup>9, 21, 28, 29</sup>.

### 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<sup>31,32</sup>. An association between marital dissatisfaction, problems in interpersonal relations and sexual problems with back pain is reported in non-pregnant women<sup>33,34</sup>. 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<sup>34</sup>. An association between neuroticism and back pain, especially in its chronic form, is reported<sup>35,36</sup>.

### *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 <sup>7, 9, 16, 19, 29, 37</sup>. However data on other biomedical factors are conflicting. Higher weight and lower age are reported to be associated with back pain <sup>4, 7, 9, 38</sup>. 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 <sup>39-41</sup>, but in most studies on back pain in pregnancy exercise is not an associated factor <sup>5,11,37</sup>.

A relation between smoking and back pain is reported in pregnant and non-pregnant women and men <sup>8,20,21,42,43</sup> but a causal relationship is doubtful <sup>43</sup>. 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 <sup>5, 7, 8, 9, 15, 21, 28</sup> and the obstetrical outcome of the study population was identical to that of comparable women registered in the Netherlands Perinatal Registry 2001 <sup>44</sup>. 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 <sup>45, 46</sup>.

## 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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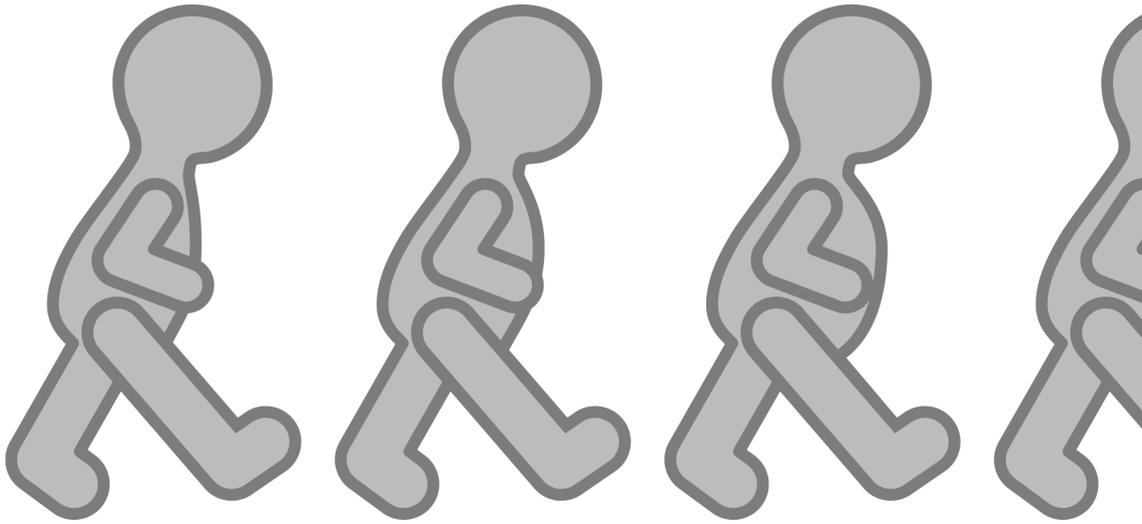
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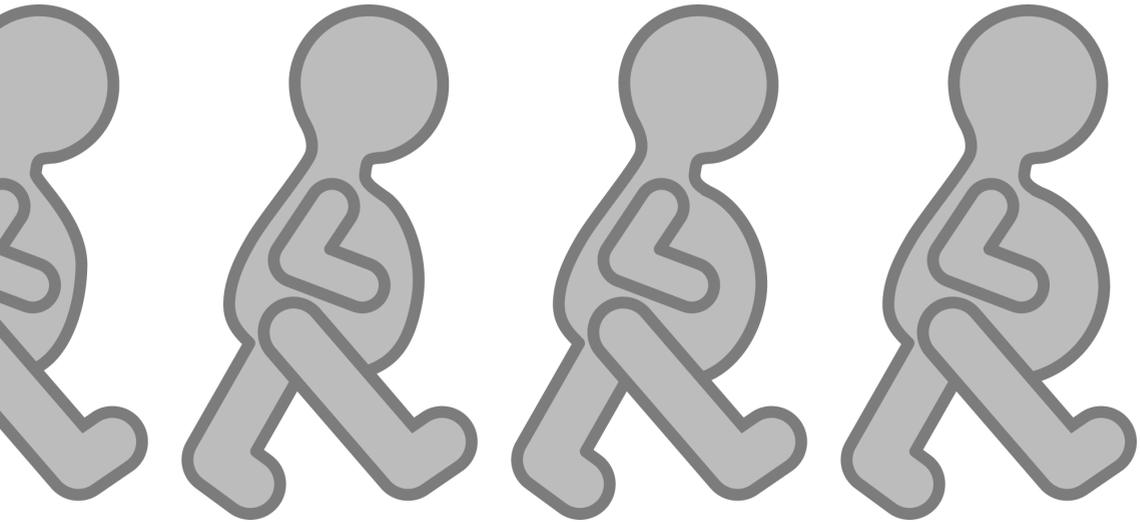
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## Chapter 3

### The Pregnancy Mobility Index: A mobility scale during and after pregnancy

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## Abstract

**Background:** During pregnancy, every second woman will experience some degree of back or pelvic pain. While several validated instruments to assess back pain exist for the general population, these are not suitable for application in a pregnant population and have not been validated for this purpose. A pregnant population not only differs from the general population regarding the type of back pain –frequently a pelvic girdle component is added- but pregnant women also have different mobility patterns and expectations. We therefore present in this study a self-report mobility scale specifically designed for a pregnant population: the Pregnancy Mobility Index (PMI).

**Methods:** Longitudinal cohort study including 672 nulliparous women with a singleton low risk pregnancy. The PMI consists of items concerning day-to-day activities selected through literature research and clinical experience. Participating women completed the questionnaire at 12 and 36 weeks gestation and one year after delivery. Reliability, construct and criterion validity were tested.

**Results:** The internal consistency (Cronbach's alpha) was 0.8 or higher. The PMI-scales correlated best with the physical and pain scale of the RAND-36, indicating a good construct validity. The assumptions that the PMI scores increase during pregnancy and decrease after delivery and that women with back or pelvic problems scored higher on the PMI domains than women without back or pelvic pain were confirmed indicating a good criterion validation.

**Conclusion:** The Pregnancy Mobility Index has been shown to be a reliable and valid questionnaire well suited for use during and after pregnancy.

## Introduction

Back pain and pelvic girdle pain are very common in pregnancy. Prevalence rates of 42% -70% have been found in previous prospective and retrospective studies.<sup>1-9</sup> In addition to individual suffering, back pain is a major cause for sick leave and as a result, a large expense for society.<sup>10, 11</sup> The evaluation of back and pelvic pain treatment and prevention programs is challenging because definitions and nomenclature differ widely among researchers and different countries. Some researchers label pelvic pain as symptom giving pelvic girdle relaxation<sup>12-14</sup>, while others entitle it posterior pelvic pain<sup>15</sup> or peripartum pelvic pain.<sup>16</sup> Studies assessing back pain sometimes refer to pain in the entire back as well as to pain in the low back.<sup>1, 2, 4, 9, 15, 17</sup> Apart from this confusion, back and pelvic pain are very subjective symptoms and, while several physical tests have been described<sup>18-21</sup>, researchers will have to rely mainly on patient-reported data.

In the general population several validated self-report questionnaires have proven to be useful in assessing disability and loss of mobility caused by back pain and in evaluating treatment.<sup>22-26</sup> However, for a pregnant population such an instrument does not exist. Women suffering from back or pelvic pain during pregnancy are considered to be less mobile, experience lower quality of life<sup>27</sup> and have more problems with activities of daily living than the general population<sup>16</sup>, but these conclusions are obtained using questionnaires which are not developed and validated in pregnancy or were not validated at all. A pregnant population not only differs from the general population regarding the type of back pain –frequently a pelvic girdle component is added- but pregnant women also have different mobility patterns and expectations. This implies that it is important to develop a reliable and valid instrument to assess the effect of both back and pelvic pain during and after pregnancy on day-to-day activities. Such a mobility questionnaire specifically designed for use in a pregnant population will not only be able to evaluate treatment methods or interventions like adaptation in workload but also will help understanding normal mobility level in pregnancy. For that reason, a pregnancy-specific self-report questionnaire assessing mobility in relation to both back and pelvic pain, called the Pregnancy Mobility Index (PMI), was developed and validated in this study.

## Methods

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

### *Study-population*

Between January 2001 and July 2003 1366 nulliparous pregnant women from ten midwifery practices were requested to participate in this prospective cohort study. Inclusion criteria were sufficient knowledge of the Dutch language and a singleton low risk pregnancy, i.e. without serious pre-existing morbidity, between twelve and eighteen weeks gestation. All nulliparous pregnant women received information

about the study from their midwife. After one week the women were approached by phone asking them if they wanted to participate in the study. One hundred and twenty-two women were excluded due to having a twin pregnancy ( $n=2$ ) or miscarriage ( $n=13$ ) and 107 women did not speak the native language well enough; 1244 women met the inclusion criteria. Of these 673 (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. Questionnaires were sent at 12 and 36 weeks gestation and one year after delivery. Response rate was 78% ( $n=527$ ) at 36 weeks gestation and 78% ( $n=524$ ) at one year after delivery. Women who were pregnant again at one year after first delivery ( $n=65$ ) were excluded from the analyses in this measurement. The Medical Ethics Committee of the University Medical Center approved the study. All participants signed an informed consent form.

### *Study design*

Based on an extensive literature search<sup>6, 13, 16, 28-30</sup> and clinical experience with back and pelvic pain in pregnancy 24 items covering all essential daily physical activities of pregnant women were selected. We precategorized these activities into three scales: 1) Daily mobility in the house; 2) Ability to perform normal household activities and, 3) Mobility outdoors. All items and according scales are listed in the appendix. In the questionnaire women were asked if they suffered from back or pelvic pain while performing the activities, and, if so, to indicate the level of mobility by choosing one of four possible answers in each item: 'no problems performing this task'- 'some effort performing this task'- 'much effort performing this task'- 'performing this task is impossible or only possible with the aid of others'. These answers were recoded to scores from 0 to 100, in which 0 equals 'normal performance' and 100 indicates 'maximum disability'. Scale scores were calculated by taking the mean value of the items of that scale.

In this study we assessed reliability, construct validity and responsiveness of the newly developed instrument. First, by calculating Cronbach alpha's in the first 250 women at 12 weeks gestation the internal consistency of the PMI-scales was assessed. Subsequently the alphas were retested in the last 422 women.

Secondly, construct validity was tested using the native version of the RAND-36.<sup>31, 32</sup> The RAND-36 is a widely used generic quality of life questionnaire consisting of eight domains regarding physical and emotional functioning, both physical and emotional role limitation, mental health, vitality, pain and general health perception. The scale scores range from 0 to 100. A higher score indicates a better health status of the subject. Since the PMI is a mobility measure related to back pain, we assumed that the PMI scales should correlate well with the physical functioning and pain scales and less with the emotional and social functioning scales of the RAND-36. Thirdly, criterion validity of the PMI-domains, i.e. the responsiveness or the ability to detect change over time that is clinically meaningful was assessed. The assumption is tested that mobility decreases with gestational age, and increases again after delivery. To test this assumption, the scores at 12 weeks gestation were compared with the scores at 36 weeks gestation using Wilcoxon's paired rank test. Because the PMI is not normally distributed non-parametric tests are used.

We tested the questionnaire again one year after delivery and, for obvious reasons, excluded all women who were pregnant again (n=65). The statistics were repeated for PMI scores at 12 weeks gestation and one year after delivery and again for 36 weeks gestation and one year after delivery. Participating women were also asked if they were experiencing pelvic or back pain at the time of the measurement. Because of the diversity in definitions of back and pelvic pain we did not specify the nature and location of this pain for this study. If the PMI is a clinical useful tool, it should differentiate well between women with and without back or pelvic girdle pain. Therefore, the mean PMI scale scores of women with back or pelvic girdle pain were compared to those without these symptoms, using the Mann-Whitney test.

## Results

The prevalence of self-reported back and/or pelvic pain was 47.1% and 60.9% at respectively 12 and 36 weeks gestation. One year after delivery this prevalence dropped to 30.8%.

### *Internal consistency*

The reliability coefficients of the three scales in the first sample of 250 women at 12 weeks gestation were 0.90 for the Daily mobility in the house, 0.87 for Household activities and 0.79 for Mobility outdoors. In the second sample, of the remaining 422 women at 12 weeks gestation, the Cronbach alphas were respectively 0.89, 0.90 and 0.90 for Daily mobility, Household activities and Mobility outdoors.

### *Construct validity*

Construct validity was assessed by comparing the PMI with the RAND-36. Table 1 shows the Spearman's correlation coefficients between RAND-36 and PMI. The coefficients are negative because a higher score in the PMI means lower mobility, while a higher score in the RAND-36 means better quality of life. All correlation coefficients were significant at  $p < 0.001$  level. The correlations between the PMI and RAND 36 physical functioning and pain scale were in the range of what is considered moderate, the correlations between the PMI and the other scales of the RAND-36 were below 0.3 and therefore considered poor.

*Table 1. Spearman's correlation coefficient at 12 weeks gestation between PMI and RAND-36*

RAND-36-scales	Pregnancy Mobility Index-scales		
	Daily mobility	Household activities	Mobility outdoors
<b>Physical functioning</b>	-0,44	-0,51	-0,40
<b>Role limitations in physical activities</b>	-0,31	-0,31	-0,27
<b>Role limitations emotional</b>	-0,23	-0,24	-0,18
<b>Vitality (energy and fatigue)</b>	-0,25	-0,27	-0,29
<b>Mental health</b>	-0,23	-0,25	-0,22
<b>Social functioning</b>	-0,26	-0,25	-0,24
<b>Bodily pain</b>	-0,47	-0,45	-0,37
<b>General health perceptions</b>	-0,33	-0,36	-0,35

All correlation coefficients are significant at the  $p < 0.001$  level (2-tailed).

### *Criterion validation*

Wilcoxon's paired rank tests were performed to assess responsiveness of the PMI. Mean scores at all three measurements are shown in table 2. The score on all PMI scales was significantly higher at 36 weeks gestation as compared to 12 weeks gestation ( $p < 0.001$ ), meaning decreased mobility. One year after pregnancy, PMI-scores were significantly lower than at 12 and at 36 weeks gestation (both  $p < 0.001$ ), meaning increased mobility. Women suffering from back pain at 36 weeks scored significantly higher on all three scales compared to women without back or pelvic pain (table 3).

*Table 2. Mean scores of the PMI-scales at different measurements.*

	12 weeks gestation	36 weeks gestation	One year after delivery
<b>Daily mobility</b>	9,51 (13.66)	26.94 (20.73)	5,53 (10.81)
<b>Household activities</b>	12,34 (15.51)	27.65 (21.09)	7,67 (13.18)
<b>Mobility outdoors</b>	2,99 (7.35)	11.26 (13.60)	2,21 (6.99)

The three scales are significantly different at  $p < 0.001$  level (2-tailed) compared to the other measurements, using Wilcoxon's paired rank tests

*Table 3. Means of women with and without back or pelvic pain at 12 and 36 weeks gestation and p-value of difference using (non-parametric) Mann-Whitney tests.*

	<b>No back/pelvic pain</b>	<b>Back/pelvic pain</b>
<b>12 weeks gestation</b>	<b>N=355</b>	<b>N=316</b>
Daily mobility	2.50 (6.40)	17.40 (15.28)
Household activities	4.96 (7.79)	20.99 (17.68)
Mobility outdoors	0.94 (3.97)	5.45 (9.43)
<b>36 weeks gestation</b>	<b>N=204</b>	<b>N=322</b>
Daily mobility	13.71 (14.56)	35.23 (19.71)
Household activities	16.39 (14.09)	34.76 (21.72)
Mobility outdoors	5.39 (8.44)	15.18 (14.96)
<b>One year after delivery</b>	<b>N=169</b>	<b>N=351</b>
Daily mobility	0.89 (3.48)	16.03 (13.99)
Household activities	2.52 (6.30)	19.91 (16.75)
Mobility outdoors	0.50 (2.76)	6.11 (11.03)

All comparisons were statistically significant at  $p < 0.0001$  level.

## Discussion

In this study we constructed and validated a new self-report questionnaire for use in a pregnant population to assess mobility in relation to back and/or pelvic pain. Our data show that the questionnaire is consistent, reliable and able to distinguish between normal and abnormal mobility.

Although it is well established that back and pelvic pain symptoms are highly prevalent during pregnancy and it is alleged that it limits mobility, a reliable tool to measure this mobility had not yet been developed. Several self-report questionnaires that are being used in the general population to determine function and disability in patients suffering from back pain have been reported in the literature.<sup>22, 24-26, 26, 33</sup> Some of these questionnaires are also used in pregnancy.<sup>27, 30, 34, 35</sup> However, none is specifically designed for women only, or more specifically for a pregnant population. For example, in the Disability Rating Index<sup>25</sup>, used in a pregnant population by Olssen et al<sup>27</sup> and Nilsson-Wikmar et al<sup>35</sup>, one of only 12 items is ability to run, while few pregnant women will run in the last trimester. Most questionnaires focus on low back pain. Back pain in pregnancy seems to differ from that in the general population. The incidence increases twofold and a pelvic girdle component is added. Differentiating between back and pelvic pain is often difficult<sup>18</sup>. In addition it is likely that pregnant women with back pain have different mobility patterns and expectations than men and women in the general population. Furthermore, most existing questionnaires do not exclusively focus on mobility, but also encompass additional aspects like pain frequency and social life. For example the Roland Disability Questionnaire<sup>26</sup>, used by Padua et al<sup>30</sup> in pregnancy regards among other items ability to sleep and loss of appetite. These items do not add value to the evaluation of mobility.

The Pregnancy Mobility Index presented here is specifically designed for use in a pregnant population and concerns exclusively mobility in relation to back and pel-

vic pain. The internal consistency is found to be good to excellent (Cronbach Alpha =0.8 -0.9). The PMI has good construct validity and is adequate in detecting change in mobility.

The strength of this study is that a prospective cohort design was used. Participants were all nulliparous women with low risk pregnancies. The relatively low response rate could be due to the fact that apart from back pain, pelvic floor problems and sexuality were addressed. Also, healthy people are, unlike patients, more reluctant to participate in a clinical study. Other authors also found relatively low response rates<sup>36-38</sup>. However, the prevalence of back pain in the present study is in concordance with studies with higher response rates, therefore we assume that our sample is representative of the normal pregnant population<sup>1-9, 17, 37, 39</sup>.

We decided not to perform a physical examination and to rely on pain reports of the participants because back and pelvic pain are primarily subjective symptoms.

## Conclusion

We developed and validated a new self-report questionnaire to assess mobility in relation to back and pelvic girdle pain (the Pregnancy Mobility Index). The PMI consists of three scales and was specifically designed for use in a pregnant population. The Pregnancy Mobility Index has been shown to be a reliable and valid questionnaire for use during and after pregnancy.

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## Appendix

### Pregnancy Mobility Index

Do you experience complaints/limitations in your pelvic girdle and/or back performing the following activities?

#### *Daily mobility in the house:*

- Standing up from a hard chair
- Standing up from a soft chair
- Standing up from the bed
- Getting things from the floor
- Putting on shoes
- Turning around in bed
- Standing up from the floor

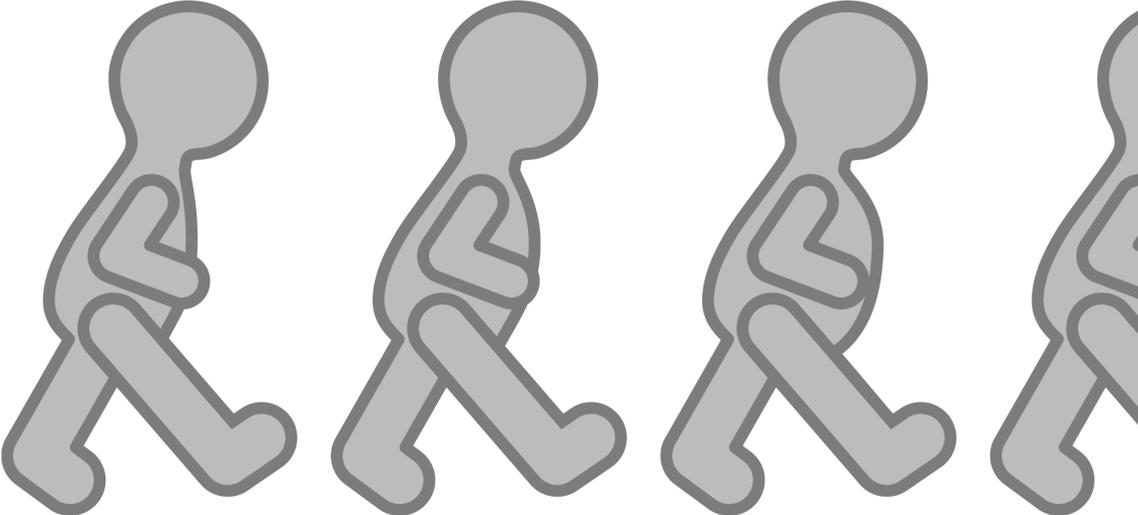
#### *Household activities:*

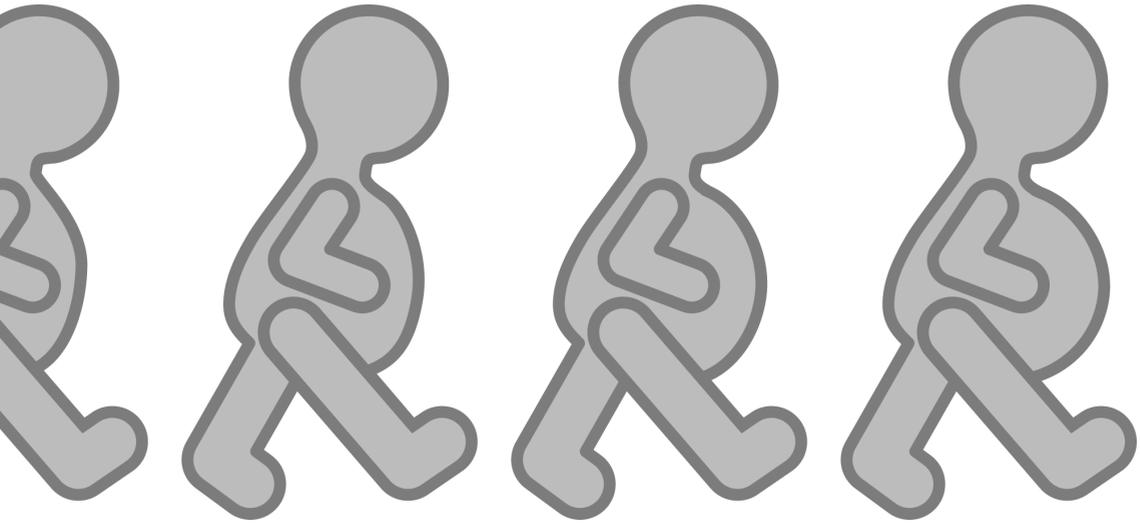
- Vacuum cleaning
- Doing laundry
- Hanging wash to dry
- Working on the knees
- Sitting in squatted position
- Working standing up
- Lifting 5 kilograms
- Lifting 10 kilograms
- Walking stairs

#### *Mobility outdoors:*

- Traveling by train
- Traveling by car
- Traveling by bicycle
- Traveling by bus
- Walking 50 meters
- Walking 200 meters
- Walking 500 meters
- Walking in uneven area

Every item has a score option from 0-3 (respectively 'no problems performing this task'- 'some effort performing this task'- 'much effort performing this task'- 'performing this task is impossible or only possible with the aid of others'), which was transformed to a 0-100 scale. Each domain score is the mean of all included items.





# Chapter 4

## Pregnancy related pelvic girdle pain in the Netherlands

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## Abstract

**Objective:** In this longitudinal cohort study we assessed the prevalence, associated delivery-related and psychosocial factors and consequences of self-reported pelvic girdle pain during and after pregnancy in the Netherlands.

**Methods:** Four hundred and twelve Women expecting their first child answered questionnaires regarding back and pelvic girdle pain, habits, and biomedical, Sociodemographic and psychosocial factors at 12 and 36 weeks gestation and three and twelve months after delivery. In addition, birth records were obtained. Possible associations were studied using non parametric tests.

**Results:** The prevalence of self-reported pelvic girdle pain was at its peak in late pregnancy (7.3%). One out of six women suffering from pelvic girdle pain at 36 weeks gestation and almost half of the women suffering from pelvic girdle pain three months after delivery still reported symptoms one year after delivery. Women reporting pelvic girdle pain are less mobile than women without pain or women with back pain only and more frequently have to use a wheelchair or crutches. No association was found between obstetric factors and pelvic girdle pain. Women with pelvic girdle pain report more co-morbidity and depressive symptoms.

**Recommendations:** Normal obstetric procedures can be followed in women reporting pregnancy related pelvic girdle pain. Prognosis is generally good, however, women reporting pelvic girdle pain three months after delivery need extra consideration. Attention needs to be given to psychosocial factors, in particular depressive symptoms.

## Introduction

About ten years ago, much interest was drawn to the, according to some, new phenomenon of pelvic instability (PI) in the Netherlands. Although symphyseal rupture and symphysiolysis have been described since ancient times, obstetricians and midwives were increasingly confronted by women suffering from pregnancy-related pelvic girdle pain without evident symphyseal rupture or symphysiolysis. The lay press has paid much attention to pregnancy related pelvic girdle pain in the years 1992-1996, and since then the term pelvic instability is widely used by lay people in the Netherlands. The term pelvic instability applies to pain in the area of the anterior and posterior pelvic girdle, sometimes radiating to the perineal area and the lower extremities. The use of the term pelvic instability implies that instability of the pelvic joints is the cause of the symptoms. However, joint distention can be shown in many pregnant women and the degree of instability is not correlated to the severity of symptoms.<sup>1</sup>

Assessing prevalence rates is complicated, as they are sensitive to terminology, definitions and study population. While prevalence rates during pregnancy are estimated at 45% for back pain and 25% for pelvic girdle pain,<sup>2</sup> the distinction between back and pelvic girdle pain is not always very clear. Prevalence rates for the Netherlands are not available. Studies conducted in the Netherlands, have recruited women through the patient association for pelvic girdle pain or through treatment centers<sup>3, 4</sup>. Therefore, prevalence of so-called pelvic instability in a healthy pregnant population is not known. Data on consequences of PI such as sick leave and mobility and the comparison of these consequences with women with pregnancy-related back pain, are also lacking. There is no consensus regarding factors that may be associated with pregnancy-related pelvic girdle pain<sup>2</sup>. In general, it is assumed that obstetrical factors are not associated with pelvic girdle pain,<sup>5</sup> although some data point in the opposite direction<sup>3</sup>. The role of psychosocial factors is not clear. Physical-diagnostic criteria for PI are lacking; diagnosis is therefore based on anamnestic data<sup>5</sup>.

In this study we analyzed the prevalence and consequences of self reported PI in a healthy population of women during their first pregnancy up until one year after delivery. Possible associated psychosocial, biomedical and obstetrical factors were also assessed.

## Methods

### *Study population*

Between January 2001 and July 2003, 1366 nulliparous pregnant women from ten urban midwifery practices in the center of The Netherlands were approached to take part in a prospective longitudinal cohort study assessing pelvic floor problems, sexuality and back and pelvic girdle pain during first pregnancy until one year after delivery. All new 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. Inclusion criteria were a singleton

low risk pregnancy and sufficient knowledge of the Dutch language.

One hundred and twenty-two women were excluded due to having a twin pregnancy (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 intimacy of the questions. The present study is a separate analysis of data collected in the larger study. The Medical Ethics Committee of the University Medical Center Utrecht approved the study. All participants signed an informed consent form.

### *Data collection*

Self-report questionnaires were sent at 12 and 36 weeks gestation and three and 12 months after delivery. Women with pelvic instability were identified with the question: "Do you think you suffer from pelvic instability?". Whether women suffered from back pain in present pregnancy was established by the asking "Do you suffer from back and/or pelvic pain at the present time?". If yes, 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. To determine a history of back pain, women were asked if they had visited a doctor prior to their pregnancy because of back pain. In addition, participants were asked if they needed crutches or a wheelchair and if and how they were treated for pelvic instability. A questionnaire assessing mobility (the Pregnancy Mobility Index (PMI)) was administered. This questionnaire consists of three scales: daily mobility at home, ability to perform normal household activities, and mobility outdoors. Each scale ranges from 0 to 100, in which 0 equals 'normal performance' and 100 indicates 'maximum disability'. The Pregnancy Mobility Index has been shown to be a reliable and valid questionnaire well suited for use during and after pregnancy<sup>6</sup>.

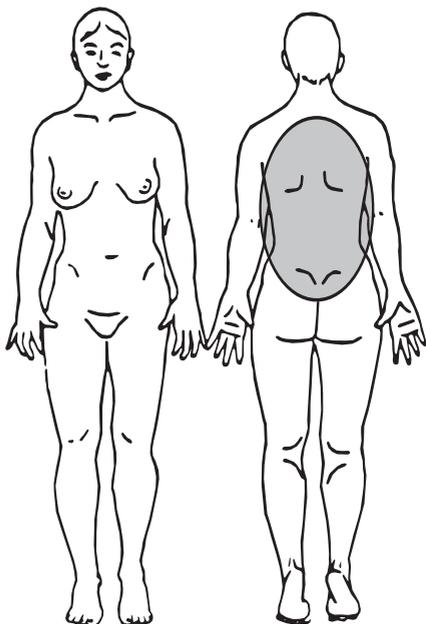
Biomedical, sociodemographic and behavioral and psychosocial variables were assessed. Women were asked if they suffered from any chronic disease such as asthma. Because all women were recruited from midwifery practices, sufferers from serious illnesses are not included in the sample as they receive care from clinical obstetricians. Women who were referred to a gynecologist after start of the study remained included. Obstetrical data were obtained from involved midwives and obstetricians/gynaecologists. Educational level was divided in high school or less and more than high school.

Psychosocial factors were studied using the following questionnaires. The Dutch Personality Questionnaire (DPQ) contains 133 statements which are divided into seven domains: inadequacy, social inadequacy, rigidity, hostility, egoism, dominance and self esteem<sup>7</sup>. 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<sup>8,9</sup>. 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<sup>10</sup>. 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. Based on previous studies assessing factors associated with pregnancy-related pelvic girdle and back pain, several factors were examined regarding their association with pelvic instability<sup>11-21</sup>. These factors are listed in table 1.



*Figure 1 Only women who located pain in the gray area were considered to have back pain.*

*Table 1: Examined factors.*

History of back or pelvic pain	Birth weight of the neonate
Age at time of delivery	Gender of the neonate
Educational level	Gestational date at time of delivery
Leisure time physical activity	Duration of first stage of parturition
Employment	Duration of second stage of parturition
Comfortable working position	Mode of delivery
Job satisfaction	Epidural anaesthetics
Smoking and use of alcohol	Score 7 DPQ-scales
Chronic diseases	Total score CES-D
Body Mass Index	Score 2 MMQ-scales

DPQ= Dutch Personality Questionnaire, CES-D= Center for Epidemiologic Studies Depression scale, MMQ= Maudsley Marital Questionnaire.

### *Statistical analysis*

Possible factors associated with PI were compared in women with and without PI at 36 weeks gestation and three months postpartum in univariate analysis. Because of the low prevalence of pelvic instability, non parametric tests (Mann-Whitney and Kruskal-Wallis test) were used. Multivariate logistic regression analyses (stepwise forward method) were performed for factors statistically significant at  $p < 0.05$  level in univariate analyses. The presence or absence of PI was used as the dependent variable. To define the possible effect of psychosocial factors together, variables were entered in the logistic regression analysis in two blocks: block 1 for non-psychosocial 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.

## **Results**

### *Response rates*

The personality questionnaire, sent at 24 weeks gestation, was answered by 642 women (95.7%). The questionnaires at 36 weeks gestation and three and twelve months after delivery were answered by respectively 527 (78.4%), 503 (74.9%) and 524 (78.0%) participants. One year after delivery, 65 (12.4%) women were pregnant again. They were left out in the calculation of the prevalence rate. Birth records were obtained through midwives and obstetricians from 505 participants (75.1%). Women who responded at 12 and 36 weeks gestation and three months after delivery were included in the analysis ( $n=412$ ).

Table 2 shows the characteristics of the study population.

*Table 2: Sample characteristics (N=412).*

		Mean/number	SD/%
<b>Age at time of delivery (years)</b>		30.5	3.7
<b>Educational level</b>	High school or less	199	48.3%
	More than high school	213	51.7%
<b>Employed</b>	Antepartum	391	94.9%
	Postpartum	327	79.4%
<b>Smoking</b>	Antepartum	33	8.1%
	Postpartum	43	13.7%
<b>Use of alcohol</b>	Antepartum	59	14.6%
	Postpartum	176	56.2%
<b>Chronic diseases</b>	Total	38	9.2%
	Pulmonary disease (i.e. asthma)	18	4.4%
	Connective tissue disease	5	1.2%
	Thyroid disease	6	1.5%
	Dermatological disease	2	0.5%
	Other	7	1.7%
<b>Body mass index (kg/m<sup>2</sup>)</b>	12 weeks gestation	23.6	3.9
	36 weeks gestation	27.7	3.9
	3 months postpartum	24.2	4.0
	12 months postpartum	23.7	4.2
<b>Neonatal birth weight (grams)</b>		3514	479
<b>Gestational date at delivery (days from 40 weeks)</b>		0	10
<b>Mode of delivery</b>	Spontaneous	212	59.5%
	Instrumental	60	19.2%
	Caesarean Section	41	13.1%
	Unknown	99	24.0%

*Prevalence of pelvic instability during and after pregnancy*

The prevalence and incidence at different measurements are shown in table 3. Most women (n=29 (7.0%)) reported de novo PI at 36 weeks gestation. Eleven of these women (37.9%) still stated to have PI at three months postpartum and four women (13.8%) still reported PI one year after delivery. A small group of six suffered from de novo PI three months postpartum (1.5%); two of these women also reported PI twelve months after delivery (33.3%). Three women reported de novo PI twelve months after delivery (0.7%). Of the 18 women who suffered from PI three months after delivery, in six the PI persisted until twelve months postpartum, of five of these women no data was available. A total of 40 women (9.7%) reported PI at time during or after pregnancy.

*Table 3: Prevalence and incidence of pelvic instability.*

	Prevalence		Incidence	
	N	%	N	%
<b>12 weeks gestation</b>	2	0.5%	2	0.5%
<b>36 weeks gestation</b>	30	7.3%	29	7.0%
<b>3 months postpartum</b>	18	4.4%	6	1.5%
<b>12 months postpartum</b>	10	2.4%	3	0.7%

Values are given in numbers (n) and percentage.

### *Mobility*

We found that women reporting pelvic instability were significantly less mobile in comparison to women without PI or women with back pain only. The average scores of the PMI for each group are shown in table 4. Women with PI also had to use crutches or a wheelchair more often than women without PI (OR 29.2 [5.1-167.1]). Of the 40 women who reported PI at any time during or after pregnancy, 5 needed crutches or a wheelchair (12.5%). However, one of these women, who used a wheelchair at 12 and 36 weeks pregnancy and three months after delivery, already suffered from PI before her pregnancy. Therefore it is not plausible that this concerned pregnancy-related pelvic girdle pain. One year after delivery, none of the women with PI needed crutches or a wheelchair.

*Table 4: Mean Pregnancy Mobility Index scores of different groups at 36 weeks gestation.*

	PI	Only BP	No PI	No PI/BP
<b>Daily mobility</b>	53.2 (15,1)	31.4 (18.6)	23.8(19,1)	15,4 (15,9)
<b>Household activities</b>	53.6 (20.2)	31.4 (19.5)	24.1 (18.8)	16,3 (14,5)
<b>Mobility outside</b>	27.6 (17,8)	12.6 (12.9)	9,5 (11.8)	6,2 (9,5)

PI= all women with pelvic instability, only BP= women with back pain, without pelvic instability, no PI= all women with or without back pain, but without pelvic instability, No PI/BP= women with back pain nor pelvic instability. Mean scores were compared between groups using Kruskal-Wallis tests. The PI group scored significantly higher than all other groups at  $p < 0.001$  level.

### *Treatment and sick leave*

At gestational age of 36 weeks, seven out of 30 women with PI did not receive treatment. Twenty women were treated with physiotherapy (PT), of which half also made use of a pelvic belt. Three women used the pelvic belt without PT. Three out of 18 women reporting PI three months after delivery did not receive treatment, the others received PT with or without a pelvic belt ( $n=4$ ). Four women suffering from PI one year postpartum were not treated. The remaining six women were treated with PT. Of all women, 8.1% reported in sick more than one week during pregnancy, and 3.2% postpartum because of pelvic girdle or back pain. Of the women with PI at 36 weeks gestation 41.4% needed sick leave more than one week because of PI. This is a significantly higher percentage than women with back pain only (OR 6.7 [2.8-16.2]). Twelve months after delivery, the percentage of sick leave among

women with PI was decreased to 33.3%, which is not significantly different from women reporting back pain only.

### *Associated factors*

Table 5 shows all examined factors that are statistically significant associated with PI at 36 weeks gestation or three months after delivery. Women with PI appeared to have more chronic diseases and scored higher on the domain egoism of the personality questionnaire. In addition, we found that women with PI reported more depressive symptoms on the CES-D, and scored more often above the cut-off score of 16 (OR=2.7 (95%CI [1.2-5.9])). We found no association of obstetrical factors with the occurrence of PI.

*Table 5: Significant different factors between women with and without pelvic instability.*

<b>36 weeks gestation</b>	<b>Pelvic instability (n=30)</b>	<b>No pelvic instability (n=382)</b>	<b>Crude odds ratio (95% CI)</b>	<b>Adjusted odds ratio (95% CI)</b>
<b>Chronic diseases</b>	20,0%	8,3%	2,750 (1,048-7,218)	
<b>Egoism (DPQ)</b>	11,80 (4,32)	9,32 (4,49)	1,117 (1,035-1,206)	1,104 (1,018-1,197)
<b>Total CES-D</b>	13,80 (9,89)	9,44 (6,92)	1,069 (1,024-1,116)	1,057 (1,011-1,104)
<b>3 months postpartum</b>	<b>Pelvic instability (n=30)</b>	<b>No pelvic instability (n=382)</b>	<b>Crude odds ratio (95% CI)</b>	<b>Adjusted odds ratio (95% CI)</b>
<b>Chronic diseases</b>	33,3%	8,1%	5,687 (2,001-16,164)	

Values are given in numbers (n) and percentages and crude and adjusted odds ratio's with 95% confidence interval (95% CI). DPQ= Dutch Personality Questionnaire, CES-D= Center for Epidemiologic Studies Depression scale.

## **Discussion**

The prevalence of PI is not as high as for back pain- every second pregnant woman reports back pain<sup>11 17-19 22-24</sup> – but the impact is substantial, especially the loss of mobility. A quarter of the women with PI during or after pregnancy (still) reported PI one year after delivery, this accounts for 2.4% of the total study population. Women reporting PI three months postpartum have the highest risk of long-term PI complaints: in almost half of these women PI persisted until twelve months after delivery.

In this study, we found that women with self-reported pelvic instability are significantly less mobile and need crutches or a wheelchair more often than women without PI or women with back pain only. Women with PI more often take sick leave than women with back pain only. Obstetric factors in general and mode of delivery in particular were not associated with PI. The majority of the women was treated with physiotherapy, however, some of these women did not receive treatment.

A previous Dutch study on pregnant employees confirmed that half was absent from work during more than two weeks in their pregnancy, and 29% postpartum<sup>25</sup>.

Cause of absence during pregnancy was in 40% fatigue and in 28% musculoskeletal problems, of which half concerned pelvic girdle pain<sup>25</sup>. The reason for sick leave postpartum was in half of the women musculoskeletal problems<sup>25</sup>. This means that of this study population, about 14% was absent from work more than two weeks during pregnancy and about the same percentage after delivery due to musculoskeletal problems. The difference with the percentage found in our study (8.1% during pregnancy and 3.2% postpartum more than one week sick leave) is probable due to the fact that our study population was somewhat younger (30.5 years versus 32 years) and that our population was partially unemployed (5.1%). How often women were absent from work due to other reasons than back and pelvic girdle pain, for instance fatigue, is not known. It seems likely that, because of the higher prevalence of chronic diseases in women with PI, these women need more sick leave than women without PI. This suggests that in addition to individual suffering and loss of mobility there are important socio-economic factors that need to be taken into account.

### *Associated factors*

Women with PI report more depressive symptoms and more frequently have an indication of a clinical depression. The coexistence of depressive symptoms, especially in back pain, has been described in previous studies<sup>26-28</sup>, and has a negative effect on the prognosis of back pain<sup>29</sup>. This association has not yet been described in pelvic girdle pain, and the causal direction is not clear. It seems plausible that both symptoms reinforce each other. Therefore it is important to recognize and, if necessary, treat depressive symptoms along with pelvic pain. Women with PI report more often chronic diseases. Because this concerns a rather small group of women, it is difficult to draw conclusions from this finding. In previous reports, a parallel is suggested between PI and fibromyalgia and Myalgic Encephalomyelitis<sup>30</sup>. In our study, however, these diseases do not occur more often in women with PI compared to women without PI.

Women with PI scored higher on the egoism domain of the personality questionnaire. A higher score indicates that participants are more satisfied with themselves and do not take notice of others and their problems<sup>7</sup>. Several studies are conducted concerning personality and the occurrence of disease, especially chronic pain<sup>26</sup>. Certain personality traits could hypothetically be more vulnerable to disease, especially disease for which exact pathologic etiology is lacking and in which psychosomatic factors might be causative. For instance, in chronic pain patients more neurotism is found<sup>31</sup>. For clinical practice, the implication of the finding that women with PI are more egoistic is not clear.

The importance of present study is that this is the first inventory of the Dutch situation concerning self-reported pelvic instability in a healthy population of women expecting their first child. We used a longitudinal cohort design with validated questionnaires. Although several diagnostic tests exist to diagnose pregnancy related pelvic girdle pain, these tests are only used by specialized physiotherapist, and not on large scale by general practitioners, midwives or obstetricians<sup>32, 33</sup>. Referral for treatment of pelvic girdle pain or so-called pelvic instability is mainly based on

anamnestic data. Therefore we choose to rely on self-report questionnaires. Due to the quantity and intimate nature of other questions on sexuality and pelvic floor discomfort the response rate was only 54%. However, prevalence rates of pelvic floor problems and back pain found in this cohort are in concordance with prevalence rates in other studies, and the obstetrical outcome of the study population was similar to that of comparable women registered in the Netherlands Perinatal Registry 2001<sup>34, 35, 36</sup>. Therefore we consider this is a representative sample of the normal pregnant population.

## Conclusion

The prevalence of self-reported pelvic instability is at its peak in the last trimester of pregnancy (7.3%). We found that one out of six women with PI at 36 weeks gestation still reports PI one year after delivery. Women with PI have less day-to-day mobility than women without PI or with back pain only and needed more often sick leave and crutches or wheelchairs. None of the women in this study reporting PI during or after pregnancy needed crutches or a wheelchair one year after delivery. No association was found between PI and obstetrical factors. PI was found to be associated with egoism, the presence of mild chronic diseases and depressive symptoms.

## Recommendations

Back and pelvic girdle pain are highly prevalent in pregnancy. Although prognosis is generally good, these symptoms, especially so-called pelvic instability, can be very disabling and account for a large part of sick leave during pregnancy. Treatment and prevention programs need to be optimized<sup>37, 38</sup>. To accomplish this, there is an urgent need for consensus regarding definitions and terminology. Women reporting pelvic instability three months after delivery have the highest risk of long-term symptoms and particularly need monitoring and treatment. Normal obstetric procedures can be followed in women reporting pelvic instability, since no association is found with obstetric factors.

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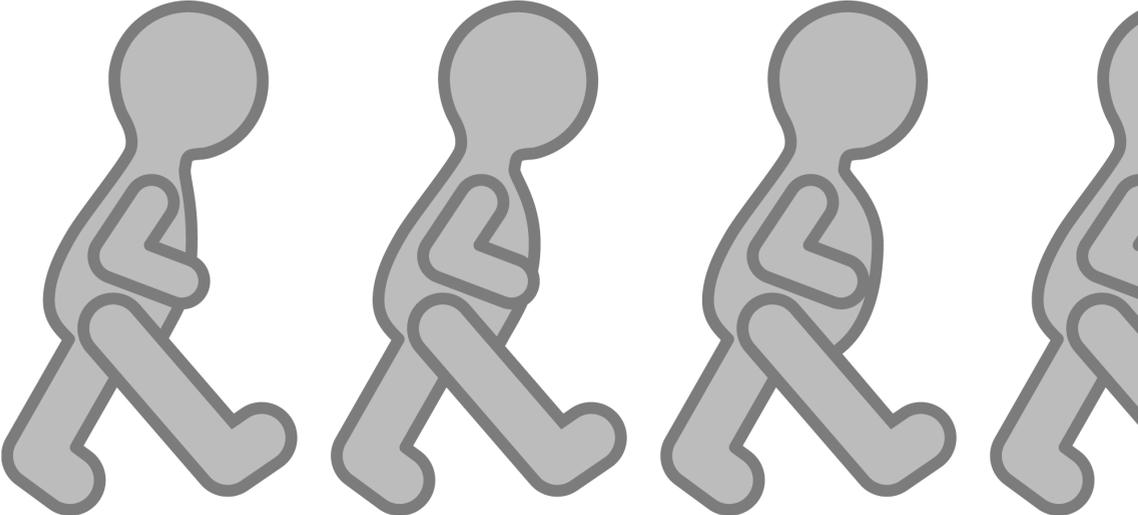
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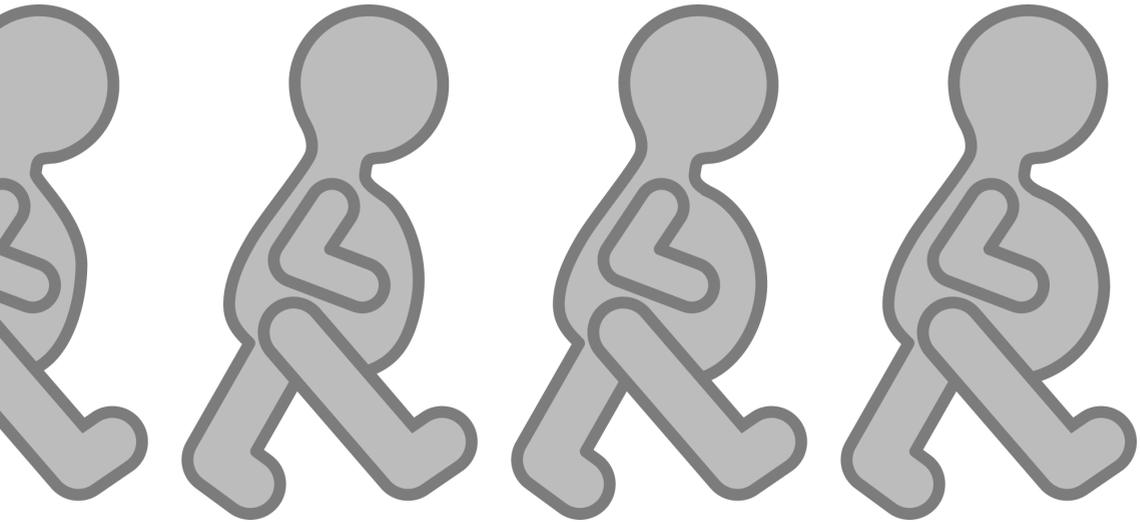
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## Section 2





# Chapter 5

## Psychosocial factors and mode of delivery

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## Abstract

Childbirth is a substantial physical and emotional endeavour. Because emergency Caesarean and instrumental vaginal delivery impose a greater mortality and physical and emotional morbidity on both the mother and the infant than normal vaginal delivery, it is important to identify factors that are associated with the risk of operative delivery. In previous investigations, some associations have been found, but the effect of psychosocial factors is not clear. In this study we examined several factors which could be associated with the risk for instrumental and surgical delivery. In addition to biomedical factors we included psychosocial factors such as depressive symptoms, quality of the relationship of the woman with her partner, personality, lifestyle and educational level. We assessed 354 healthy nulliparous pregnant women with a child in vertex presentation and spontaneous onset of term labour using validated questionnaires.

We found that social support from the woman's partner in pregnancy, lack of depressive symptoms and specific personality traits are not protective against instrumentally assisted vaginal delivery or emergency Caesarean section. Predictive factors for operative delivery after spontaneous onset of labour are higher foetal weight, non occiput anterior presentation and advanced gestational age, and foremost foetal distress during parturition.

## Introduction

The impact of psychosocial and socioeconomic factors on the occurrence of disease is becoming increasingly important in medical research. In various fields of medicine substantial evidence is available on how chronic stress, personality traits, depression, low social support and low socioeconomic status effect the cause and course of disease, such as coronary artery and gastrointestinal disease<sup>1-4</sup>. In obstetrics, studies of the association between social support and pregnancy outcomes indicate that poor social support is associated with preterm birth and low birth weight<sup>5</sup>. In addition, evidence is found that maternal stress, depressive symptoms and anxiety are associated with preterm birth and low birth weight<sup>6-8</sup>. Neuroendocrine, immune, inflammatory and vascular pathways are suggested to explain these associations<sup>9</sup>.

Childbirth is one of the most important events in women's lives. Not only is parturition the transition to motherhood, delivery itself has a substantial physical and emotional impact. Emergency Caesarean and instrumentally assisted vaginal delivery are associated with increased morbidity, and mortality on both the mother and the infant than spontaneous vaginal delivery<sup>10-12</sup>. Therefore, it can be important to identify factors that are associated with this risk of operative delivery. Several maternal characteristics, such as parity, height, age, ethnicity and even shoe size, have been associated with mode of delivery<sup>13-18</sup>. Foetal factors such as macrosomia, presentation during delivery and foetal distress have also been associated with the risk for operative delivery and, thus, greater morbidity and mortality<sup>19,20</sup>. The extent to which psychosocial factors are associated with the mode of delivery has not yet been investigated.

In animal studies, stress – such as attendance of observers and unknown sounds – has been found to delay parturition<sup>21</sup>. Similarly, in humans, trait anxiety appears to be related with prolonged labour<sup>22</sup>. Whether symptoms of depression could hamper delivery is not clear as reports on the association of depressive symptoms and the need for operative delivery are conflicting<sup>23-25</sup>. There are no data available concerning personality and mode of delivery.

In this study we examined several factors and their association with the risk at instrumentally assisted vaginal births or emergency Caesarean section after spontaneous onset of term labour. We included psychosocial factors such as depressive symptoms, quality of the relationship of the woman with her partner, personality, lifestyle and educational level.

## Methods

### *Study population*

Between January 2001 and July 2003, 1366 nulliparous pregnant women from ten urban midwifery practices in the centre of The Netherlands were approached to take part in a prospective longitudinal cohort study assessing pelvic floor problems, sexuality and back pain during their first pregnancy until one year after delivery. 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 wan-

ted to participate in the study. Inclusion criteria were a singleton low risk pregnancy and sufficient knowledge of the Dutch language. One hundred and twenty-two women were excluded due to having a twin pregnancy (n=2), miscarriage (n=13) or insufficient knowledge of the Dutch language (n=107). Thus, 1244 women met the inclusion criteria. Of these 672 (54%) decided to participate in the study. The most common reasons for refusal to participate was lack of time and the objective of the questions (especially sexuality and pelvic floor function). The present study is a separate analysis of data collected in the larger study. Our study objective was to investigate factors that are associated with instrumentally assisted vaginal delivery or emergency Caesarean section in nulliparous term women with vertex presentation. Therefore, we excluded women with breech presentation, preterm delivery, elective Caesarean section or induced labour. Women with spontaneous vaginal delivery were compared to women with instrumentally assisted vaginal delivery or emergency Caesarean section. The Medical Ethics Committee of the University Medical Centre Utrecht approved the study. All participants signed an informed consent.

### *Data Collection*

Self-report questionnaires containing questions about biomedical, sociodemographic, behavioural, and psychosocial factors were mailed to study participants at 24 and 36 weeks gestation. The following validated psychosocial instruments pertained to the present study. The Dutch Personality Questionnaire (DPQ) contains 133 statements which are divided into seven domains: inadequacy, social inadequacy, rigidity, hostility, egoism, dominance and self esteem<sup>26</sup>. The higher the score, the more these characteristics are part of the subject's personality. The sub-scales scores range from 0-30 or 0-50. Because personality is considered to be stable over time, this questionnaire is completed only once, at 24 weeks gestation.

The Centre for Epidemiologic Studies Depression scale (CES-D) is developed for use in non-psychiatric populations to assess depressive symptoms and a tendency towards depression<sup>27,28</sup>. The total score ranges from 0 to 60; a higher score corresponds with more symptoms. The frequently used cut-off score of 16 or above is an indication of a probable depression.

The Maudsley Marital questionnaire (MMQ) was used to measure the perceived satisfaction with the emotional and sexual relationship of the participant with her partner<sup>29</sup>. The MMQ consists of 15 questions, of which 10 concern emotional (total score 0-80) and 5 concern sexual aspects (total score 0-40) of the relationship. The higher the score, the poorer this specific aspect of the relationship is perceived.

In addition, questions were asked concerning Body Mass Index of the mother at 36 weeks gestation, age of the mother at time of delivery, marital status, duration of relationship with their partner, presence of non-obstetric co-morbidity, use of medication, educational level, employment, and if so whether the women was satisfied with her work, smoking and drinking habits and whether the women was involved in leisure-time physical activities. Obstetrical data - i.e. gestational age at delivery, weight, gender and presentation of the infant at birth (occiput anterior presentation or otherwise), foetal distress and the use of epidural anaesthetics - were obtained from involved midwives and obstetricians/gynaecologists.

### Statistical analyses

All above-mentioned variables were compared for women with and without instrumentally assisted delivery/emergency Caesarean section by means of non-parametric tests. Education level was dichotomised in high school or less and more than high school. The mode of delivery was used as the dependent variable. Multivariate logistic regression analyses (stepwise forward method) were performed for variables statistically significant at  $p < 0.05$  level in bivariate analyses. To define the possible effect of psychosocial factors together, variables were entered in the logistic regression analysis in two blocks: block 1 for non-psychosocial factors and block 2 for psychosocial factors. Logistic regression analyses were also used to calculate crude and adjusted odds ratios (Exp(B)) for continuous variables significant at  $p < 0.05$  level. All analyses were performed with SPSS for Windows 11.5.

### Results

Of the 672 women who were eligible and interested in participating in the study, 642 (95%) and 527 (78%) women responded to the questionnaire at 24 and 36 weeks gestation respectively. For 498 women delivery records were obtained. Women who delivered by elective Caesarean section or unknown mode of delivery ( $n=38$ ), by induced labour ( $n=79$ ), who had preterm labour ( $n=24$ ) or breech presentation ( $n=3$ ) were excluded. Therefore, the total population used in the analyses is 354 (see figure 1).

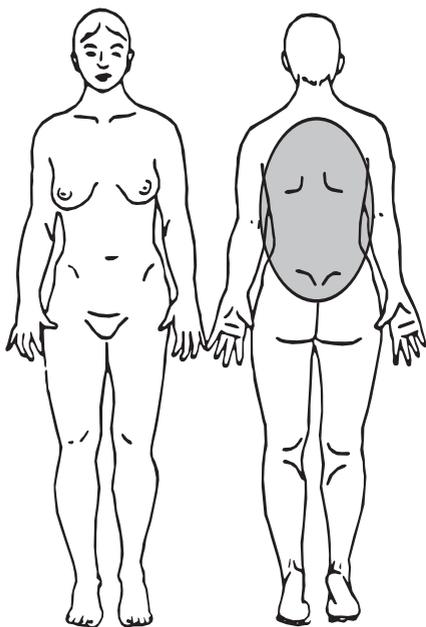


Figure 1 Only women who located pain in the gray area were considered to have back pain.

The average age at delivery was 30.0 years (standard deviation (SD) 3.6). Fifty-two point seven percent of the women had high school or less. After spontaneous onset of labour, 254 (71.8%) women delivered spontaneously and 100 (28.2%) women needed to be instrumentally assisted or an emergency Caesarean delivery. Women who had an instrumentally assisted vaginal birth or emergency Caesarean delivery had higher BMI at 36 weeks gestation, less leisure time physical activity, longer gestational age, more foetal distress, less often non occiput anterior vertex presentation, higher birth weight, better subjective perception of the relationship with their partners during pregnancy (MMQ) and higher self esteem (DPQ). Table 1 shows these variables and their crude odds ratios. In multivariate logistic regression analysis only foetal distress, foetal presentation, birth weight, and subjective perception of the relationship with their partners had an independent effect on mode of delivery. Table 1 shows the adjusted odds ratios. Explained variance with this model was 27% (R-square). Foetal distress accounted for the majority of this variance (14.4%). No associations were found with marital state, depressive symptoms, life style or personality.

## Discussion

In this study we assessed the relationship between biomedical, neonatal and psychosocial factors and the risk of instrumentally assisted birth. Our data show that the majority of the variance of mode of delivery in spontaneous onset delivery is explained by obstetrical characteristics like an abnormal presentation, birth weight, gestational age, and, most important, foetal distress. Some variance is explained by higher quality of the emotional relationship with the partner. We found no independent associations between mode of delivery and depressive symptoms and personality. High BMI has been found associated with instrumental delivery, and a high BMI increases the risk for foetal macrosomia.<sup>19 30</sup> Our data show that higher foetal weight is independently associated with the risk of an instrumental vaginal delivery or Caesarean section. This increased risk due to macrosomia is well-established, and odds ratios of 1.6-2.2 for Caesarean deliveries are described.<sup>20 30-32</sup> In the present study non-occiput anterior presentation was found to be an independent risk factor for operative vaginal or Caesarean delivery. Any presentation other than occiput anterior presentation will give a less optimal span of the head to surpass the pelvis, and therefore will increase the need for operative vaginal or Caesarean delivery. Involvement in leisure time physical activity was associated with less instrumentally assisted deliveries. Although being physically fit seems important in a strenuous event as parturition, this factor did not remain significant after multivariate logistic regression (table 1).

Surprisingly, having a better emotional relationship with the partner in late pregnancy is associated with more instrumentally assisted deliveries and emergency Caesarean sections. Examining the separate questions of the emotionality scale of the MMQ in univariate non-parametric analysis, women with operative deliveries perceived more warmth and understanding ( $p=0.005$ ), felt that their partners are more responsible ( $p=0.001$ ) and were more satisfied with their relationship

( $p=0.028$ ) at 36 weeks gestation than women with spontaneous vaginal deliveries. It is generally agreed that social support and marriage enhance health status and decrease mortality. Two proposed mechanisms are that social support imposes a direct positive effect on health, and alternatively that social support buffers the association between stressors and health.<sup>5</sup> The latter mechanism could theoretically suggest that good social support from the partner or husband buffers the stress that labour imposes on a woman and therefore will result in more spontaneous vaginal parturition. However, our data seem to point in the opposite direction. We have no good explanation for this finding. It is important to stipulate that our data concern social support from the partner received during pregnancy, and not social support at the time of delivery. Research concerning labour help by a doula shows that social support during labour is of great influence to the mode of delivery.<sup>33</sup> The strength of this study is that we used a prospective, longitudinal cohort design with standardized questionnaires in healthy nulliparous women. Due to the quantity and intimate nature of questions, not reported in this study, on sexuality and pelvic floor discomfort the response rate was but 54%. However, prevalence rates of pelvic floor problems and back pain found in this cohort are in concordance of prevalence rates in other studies and the obstetrical outcome of the study population was similar to that of comparable women registered in the Netherlands Perinatal Registry 2001. 34-36 Therefore we considered this as a representative sample of the normal pregnant population.

## Conclusion

Social support received from the woman's partner in pregnancy, having no depressive symptoms or specific personality traits are not protective against instrumentally assisted vaginal delivery or emergency Caesarean. Most predictive factors for instrumentally assisted vaginal delivery or emergency Caesarean after spontaneous onset of delivery are higher foetal weight, non occiput anterior presentation, and foremost foetal distress during parturition.

*Table 1, Associations between examined variables with instrumentally assisted birth/emergency C-section*

<b>Examined variables</b>	<b>Spontaneous vaginal birth (n=254)</b>
<b>BMI mother (kg/m<sup>2</sup>)</b>	<b>27,34 (3,65)</b>
Age	29,86 (3,73)
Married	55,5%
Duration relationship	7,05 (4,23)
Non-obstetric co-morbidity	12,2%
Use of medication	9,0%
Educational level > high school	50,0%
Employed	92,9%
Satisfied with work	92,4%
<b>Involved in leisure time physical activity</b>	<b>56,3%</b>
Gestational age	40-0,12 (7,56)
<b>Weight infant (kilograms)</b>	<b>3,475 (0,433)</b>
Gender infant (male)	50,8%
<b>Non occiput anterior vertex presentation</b>	<b>5,3%</b>
<b>Foetal distress</b>	<b>1,2%</b>
Epidural anaesthetics	13,0%
<b>MMQ Emotional</b>	<b>9,06 (8,64)</b>
MMQ Sexual	13,31 (7,88)
DPQ Inadequacy	9,89 (6,55)
DPQ Social inadequacy	7,71 (6,61)
DPQ Rigidity	24,76 (6,51)
DPQ Hostility	13,16 (6,38)
DPQ Egoism	9,12 (4,63)
DPQ Dominance	15,45 (6,02)
<b>DPQ Self esteem</b>	<b>29,15 (5,08)</b>
CES-D total score	9,96 (7,31)

Numbers are given in mean (standard deviation) or percentage.

MMQ= Maudsley Marital Questionnaire, DPQ= Dutch Personality Questionnaire, CES-D= Centre for Epidemiologic Studies Depression scale

<b>Instrumentally assisted birth/emergency C-section (n=100)</b>	<b>p-value</b>	<b>Crude Odds Ratio (95% confidence interval)</b>	<b>Adjusted Odds Ratio (95% confidence interval)</b>
<b>28,67 (4,43)</b>	<b>0,012</b>	<b>1,09 (1,02-1,16)</b>	
30,39 (3,51)	0,303		
51,5%	0,499		
7,04 (3,79)	0,761		
10,0%	0,560		
9,0%	0,987		
40,0%	0,090		
97,0%	0,148		
95,8%	0,260		
<b>43,9%</b>	<b>0,037</b>	<b>0,61 (0,38-0,97)</b>	
40+2,96 (8,47)	0,000		
<b>3,631 (0,520)</b>	<b>0,003</b>	<b>2,09 (1,25-3,50)</b>	<b>2,68 (1,40-5,14)</b>
59,0%	0,165		
<b>15,3%</b>	<b>0,002</b>	<b>3,24 (1,48-7,09)</b>	<b>3,08 (1,25-7,56)</b>
<b>20,0%</b>	<b>0,000</b>	<b>20,83 (6,03-71,94)</b>	<b>49,11 (7,32-329,31)</b>
17,0%	0,330		
<b>6,37 (6,24)</b>	<b>0,009</b>	<b>0,95 (0,92-0,99)</b>	<b>0,92 (0,88-0,97)</b>
12,20 (6,67)	0,345		
8,95 (5,99)	0,291		
7,78 (6,83)	0,981		
25,48 (7,23)	0,523		
13,13 (5,26)	0,698		
8,79 (4,19)	0,814		
14,75 (6,13)	0,265		
<b>30,39 (5,14)</b>	<b>0,026</b>	<b>1,05 (1,00-1,10)</b>	
9,15 (6,73)	0,393		

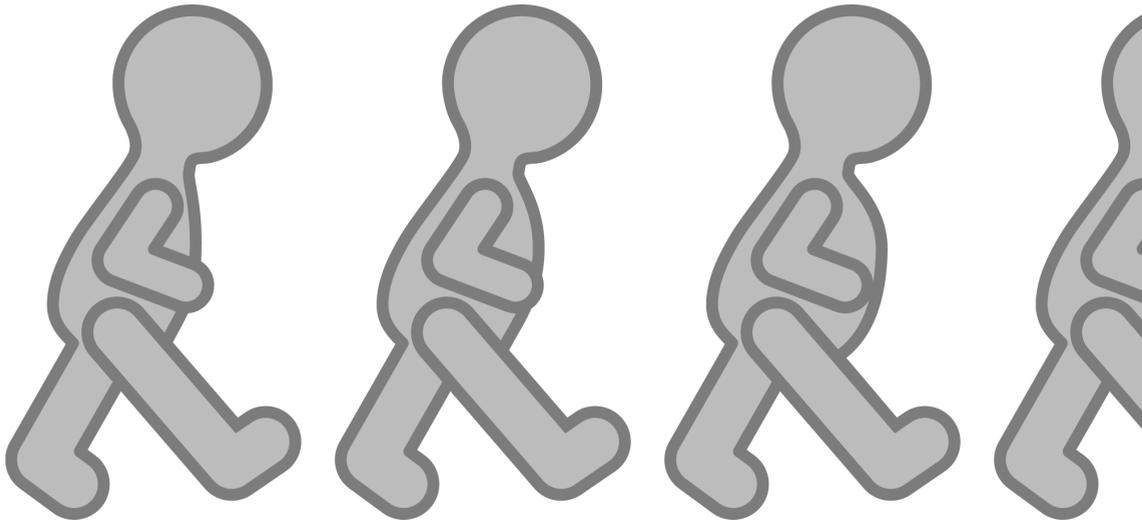
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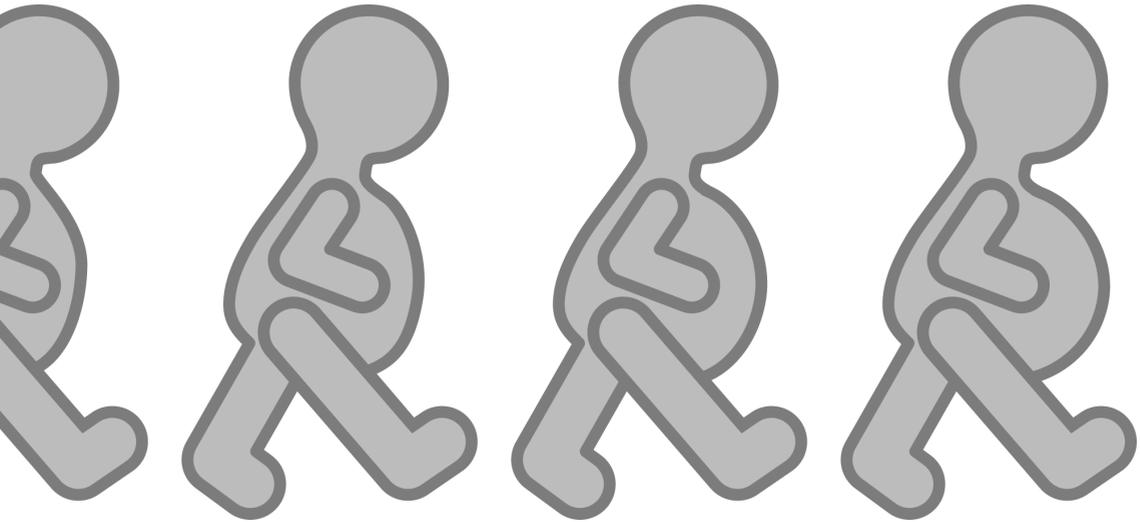
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## Section 3





## Chapter 6

**Is there an association between depressive and urinary symptoms during and after pregnancy?**

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C.H. van der Vaart

## Abstract

**Aims:** Depressive symptoms and urinary symptoms are both highly prevalent in pregnancy. In the general population an association is reported between urinary symptoms and depressive symptoms. Studies suggest a mutual etiology caused by low serotonin levels. The association of depressive and urinary symptoms has not yet been assessed in pregnancy.

**Methods:** We assessed 1) the prevalence of depressive symptoms, dry overactive bladder (OAB) syndrome and urge and stress urinary incontinence (UUI and SUI) during and after pregnancy using the Center for Epidemiologic Studies Depression Scale (CES-D) and the Urogenital Distress Inventory (UDI), and 2) the association of depressive symptoms with urinary incontinence and dry overactive bladder syndrome during and after pregnancy, controlling for confounding socioeconomic, psychosocial, behavioral and biomedical factors in a cohort of healthy nulliparous women.

**Results:** Our data show a significant increase in prevalence of depressive symptoms, UUI, SUI and dry-OAB during pregnancy, and a significant reduction in prevalence of depressive symptoms, SUI and dry-OAB after childbirth. UUI did not significantly decrease after childbirth. In univariate analysis urinary incontinence as well as dry OAB syndrome was significantly associated with a CES-D score of 16 or above at 36 weeks gestation. However, after adjusting for possible confounding factors, only dry OAB syndrome remained significant (OR 2.9 [1.5-5.6]). No association was found between depressive and urinary symptoms at one year postpartum.

**Conclusions:** Only OAB was independently associated with depressive symptoms during pregnancy. A potential mutual etiology of this association might be interesting for future treatment options, but needs to be further investigated.

## Introduction

Lifetime risk of depressive symptoms in women (5.9-21.3%) is about twice that in men and often starts in the childbearing years<sup>1-3</sup>. Prevalence rates of 10-25% during pregnancy<sup>4-9</sup> and of 6-16% postpartum are reported<sup>5, 6, 8, 10-12</sup>. Prevalence rates vary because of diversity of populations and diagnostic methodology. Most researchers found higher rates during pregnancy than after childbirth<sup>5, 6, 8</sup>.

Urogenital symptoms are also more prevalent in pregnancy than in the general population. Prevalence rates of 9-50% have been reported for urinary incontinence (UI) during first pregnancy and 34-95% for frequency and urgency symptoms (dry overactive bladder (OAB) syndrome)<sup>13, 14</sup>. Strong associations are found between depressive symptoms and urinary incontinence and overactive bladder syndrome in non-pregnant women<sup>15-19</sup>. While the relationship of depressive symptoms and urinary symptoms has not yet been explored in pregnancy, several factors have been found to be associated with depressive symptoms in a general, pregnant and postpartum population. These factors include biomedical factors such as obesity, age, chronic pain (like back pain), and previous depressive symptoms<sup>12, 20, 21</sup>, behavioral factors, like excessive use of alcohol, smoking, lack of leisure time physical exercise, and socioeconomic factors like unemployment and low job satisfaction<sup>5, 7, 22</sup>. Psychosocial factors, such as poorer social support, stressful life events, and personality features have also been found related to depressive symptoms<sup>11, 22-25</sup>.

The aim of this study was to 1) analyze prevalence of depressive symptoms and urinary symptoms during and after pregnancy and 2) assess the association of depressive symptoms with urinary symptoms, controlling for psychosocial, behavioral, socioeconomic and biomedical factors during and after pregnancy.

## Methods

### *Study population*

Between January 2001 and July 2003 1366 nulliparous pregnant women from ten urban midwifery practices in the center of the Netherlands were approached to take part in a prospective longitudinal cohort study assessing pelvic floor problems, sexuality and back pain during first pregnancy until one year after delivery. 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. Inclusion criteria were a singleton low risk pregnancy and sufficient knowledge of the Dutch language.

One hundred and twenty-two women were excluded due to having a twin pregnancy (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 present study is a separate analysis of data collected from the larger study. The Medical Ethics Committee of the University Medical Center Utrecht approved the study. All participants signed an informed consent form.

### *Data collection*

To assess the prevalence of depressive symptoms, stress urinary incontinence (SUI), urge urinary incontinence (UUI) and dry-overactive bladder (OAB) syndrome at different times during and after pregnancy, we used data obtained from all respondents of questionnaires sent at 12 and 36 weeks gestation and three and twelve months postpartum. We analyzed data obtained from the questionnaires sent at 36 weeks gestation and 12 months after delivery to assess the possible association of depressive with urinary symptoms, because urinary symptoms peak in the third trimester, and because pelvic floor symptoms occurring in pregnancy and persisting one year after delivery might be associated with depression at this time<sup>26</sup>.

Depressive symptoms were investigated using the Center for Epidemiologic Studies Depressive symptoms scale (CES-D). This scale is developed for use in non-psychiatric populations and gives an impression of depressive symptoms<sup>27, 28</sup>. 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 possible clinical depression. We refer in this study to women who scored 16 or above on the CES-D as having depressive symptoms.

Urinary symptoms were assessed with the Urogenital Distress Inventory (UDI)<sup>29, 30</sup>. The UDI is a validated, standardized questionnaire, translated in Dutch. This questionnaire consists of 19 questions about urogenital symptoms and the experienced discomfort of these symptoms. Each item measures if a urogenital symptom is present. We looked specifically at self-reported urge and stress urinary incontinence and overactive bladder syndrome. We followed the definitions of the International Continence Society (ICS)<sup>31</sup>. Urge incontinence was determined by a positive answer to the question "Do you experience urine leakage related to the feeling of urgency?". Stress incontinence was determined by a positive answer to the question "Do you experience urine leakage related to physical activity, coughing or sneezing?". Dry overactive bladder syndrome was determined when both following questions were answered positively: "Do you experience frequent urination?" and "Do you experience a strong feeling of urgency to empty your bladder?"

Validated questionnaires were used to assess potential confounding variables. The Dutch Personality Questionnaire (DPQ) contains 133 statements, which are divided into seven domains: inadequacy, social inadequacy, rigidity, hostility, egoism, dominance and self-esteem<sup>32</sup>. 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. This questionnaire was completed at 24 weeks gestation for logistic reasons. The Maudsley Marital questionnaire (MMQ) was used to measure the subjective emotional and sexual relationship of the woman with her partner and was included in the questionnaire sent at 36 weeks gestation<sup>33</sup>. The MMQ consists of 15 questions, of which 10 concern emotional (range 0-80) and 5 concern sexual aspects (range 0-40) of the relationship. The higher the score, the worse this specific aspect of the relationship is perceived.

In addition, the questionnaires addressed biomedical and socioeconomic variables. Biomedical factors included length and weight at 36 weeks gestation, age at time of delivery, the presence of a chronic illness or back pain and the use of medi-

cation. Data on length and weight were transformed into a body mass index (BMI= weight/ (height)<sup>2</sup>). Socioeconomic factors consisted of level of education, marital state, employment and job satisfaction. For practical reasons the education level was dichotomized in high school or less and more than high school. Marital state was dichotomized in married and unmarried/divorced. Behavioral factors we studied were whether or not participants smoked, used alcohol or were involved in leisure time physical activity in early pregnancy.

### *Statistical analysis*

Significant change in prevalence of depressive symptoms, UUI, SUI and dry-OAB between 12 and 36 weeks gestation and between 36 weeks gestation and 12 months after delivery was determined using McNemar tests. Possible variables associated with depressive symptoms at 36 weeks gestation, including urinary symptoms, were analyzed in all women that responded to the questionnaire at 36 weeks gestation. Women with and without CES-D score of 16 or more at 12 weeks gestation and 12 months after delivery were compared in univariate analyses using the Student's t-test for continuous and chi-square test for categorical variables. The relationship between depressive symptoms (CES-D  $\geq$  16) (dependent variable), urinary symptoms and potential confounders was assessed using multivariate logistic regression analysis (stepwise forward method) in order to assess whether urinary symptoms remained associated with depressive symptoms. Only significantly associated variables in univariate analyses were put in the model. Odds ratios (Exp(B)) for continuous variables were calculated when appropriate. The Hosmer and Lemeshow test was used to establish the goodness of fit of the model. A p-value of  $> 0.05$  indicates that the model provides a valid representation of data. All analyses were performed with SPSS for Windows 11.5.

## **Results**

Of the 672 women who started in the study at twelve weeks gestation, 642 (95%) women responded to the personality questionnaire, sent at 24 weeks gestation. The questionnaires at 36 weeks gestation and three and twelve months after delivery were answered by 527 (78%), 503 (75%) and 509 (76%) women respectively. The average age at delivery was 30.0 years (standard deviation (SD) 3.6 years). Average BMI at 36 weeks gestation was 27.9 kg/m<sup>2</sup> (SD 4.1 kg/m<sup>2</sup>). The percentage of women who's education stopped after high school was 52.7%. The prevalence rates of depressive symptoms UUI, SUI and dry-OAB at different points in time during and after pregnancy are shown in table 1. The increase in prevalence during pregnancy (from 12 to 36 weeks gestation) and decrease in prevalence after pregnancy (from 36 weeks gestation to 12 months after delivery) of all symptoms but urge urinary incontinence was statistically significant in McNemar tests ( $p < 0.05$ ). The increase in prevalence of urge incontinence during pregnancy was significant, however the seemingly decrease after childbirth was not significant. Factors significantly associated with depressive symptoms at 36 weeks gestation in univariate analyses and in multivariate logistic regression model are shown in

table 2. Many factors were significantly associated in univariate analysis, however, in logistic regression only BMI at 36 weeks gestation, being unsatisfied with occupation, inadequacy (personality trait), worse emotional and sexual relationship with the partner and dry OAB syndrome remained independently associated with depressive symptoms. The Hosmer and Lemeshow Test provided a p-value of 0.435, which indicates a proper goodness of fit for this model. Explained variance in this model (R-square) is 38.2%. At one year postpartum, no significant association was found between depressive and urinary symptoms in chi-square tests, therefore, no logistic regression analysis was performed.

*Table 1. Incidence of depressive symptoms (CES-D  $\geq$  16), incontinence and overactive bladder*

	<b>12 weeks gestation</b>	<b>36 weeks gestation</b>	<b>3 months postpartum</b>	<b>12 months postpartum</b>
<b>Depressive symptoms</b>	18,2%	20,7%	16,7%	12,2%
<b>Urge incontinence</b>	7,3%	19,1%	16,1%	15,6%
<b>Stress incontinence</b>	20,1%	42,2%	26,5%	34,3%
<b>Dry-overactive bladder</b>	54.2%	60.1%	7.8%	14.4%

## Discussion

In our study we set out to analyze prevalence of depressive and urinary symptoms during and after pregnancy and to assess the possible association of depression with urinary symptoms, while controlling for psychosocial, behavioral, socioeconomic and biomedical factors. We found significant increase in prevalence of depressive symptoms, UII, SUI and dry-OAB during pregnancy, and a significant reduction in prevalence of depressive symptoms, SUI and dry-OAB after childbirth ( $p < 0.05$ ). The prevalence of UII did not significantly decrease after childbirth. In univariate analysis urinary incontinence as well as dry OAB syndrome were significant associated with a CES-D score of 16 or above at 36 weeks gestation. However, after adjusting for possible confounding factors, only dry OAB syndrome remained significantly associated. At one year after delivery, no association was found between depressive symptoms and urinary incontinence or dry OAB syndrome. Depressive symptoms, urinary incontinence and overactive bladder syndrome are all highly prevalent during pregnancy. About one in five pregnant women reported symptoms of depression. Depressive symptoms were more prevalent during pregnancy, especially in the third trimester, than postpartum. The prevalence of depressive symptoms in these women prior to their pregnancy is unknown. We rather used the term depressive symptoms than the diagnostic term depression in this study because the CES-D dates from before the DSM IV criteria, and diagnosis of depression could therefore differ from diagnosis obtained through interview following these criteria. In addition, overestimation of prevalence of depression is possible because some depressive symptoms occur more frequent in pregnancy, such as insomnia. However, the CES-D is a widely used questionnaire with adequate

Table 2. Univariate and multivariate associated factors with depressive symptoms.

	CES-D<16 (n=405)	CES-D ≥ 16 (n=106)	Crude OR (95% CI)	Adjusted OR (95% CI)
<b>UDI</b>				
Urge Incontinence	17,4%	26,7%	1,730 (1,046-2,862)	
Stress Incontinence	39,2%	52,4%	1,706 (1,107-2,627)	
Dry overactive bladder syndrome	57,0%	73,3%	2,078 (1,291-3,342)	2,876 (1,465-5,649)
<b>MMQ</b>				
Emotionality	6,62 (6,21)	13,74 (11,33)	1,103 (1,073-1,134)	1,054 (1,014-1,095)
Sexuality	11,52 (6,95)	16,53 (8,12)	1,093 (1,061-1,126)	1,069 (1,027-1,114)
<b>NPV</b>				
Inadequacy	8,08 (5,09)	14,50 (7,79)	1,171 (1,127-1,217)	1,120 (1,065-1,179)
Social inadequacy	6,89 (6,19)	9,84 (6,96)	1,068 (1,035-1,102)	
Rigidity	24,65 (6,81)	26,47 (5,91)	1,043 (1,009-1,078)	
Hostility	12,36 (5,36)	17,12 (6,71)	1,142 (1,099-1,187)	
Egoism	9,03 (4,23)	10,56 (4,90)	1,078 (1,028-1,131)	
Self-esteem	30,30 (4,83)	27,09 (4,56)	0,879 (0,841-0,919)	
<b>BMI (kg/m<sup>2</sup>)</b>	27,59 (3,65)	29,22 (5,24)	1,095 (1,040-1,152)	1,073 (1,002-1,148)
<b>Age (years)</b>	30,50 (3,67)	29,66 (4,02)	0,942 (0,888-1,000)	
<b>Education high school or less</b>	46,9%	63,2%	1,946 (1,252-3,021)	
<b>Unemployed</b>	4,5%	12,3%	2,998 (1,418-6,336)	
<b>Low job satisfaction</b>	5,2%	15,1%	3,234 (1,566-6,678)	3,211 (1,195-8,631)
<b>Smoking</b>	7,1%	16,2%	2,532 (1,327-4,831)	
<b>Use of alcohol</b>	16,0%	6,7%	0,375 (0,166-0,846)	
<b>No Leisure time physical activity</b>	43,2%	65,1%	2,457 (1,572-3,831)	2,338 (1,281-4,267)
<b>Back pain</b>	51,9%	67,0%	1,901 (1,212-2,980)	

Shown are significantly associated factors at p<0.05 level with depressive symptoms at 36 weeks gestation in univariate analyses using T-tests and Chi-square-tests (crude OR), and in multivariate logistic regression model (adjusted OR). Non-significantly associated factors are left out in this table and in the logistic regression model. CES-D= Center for Epidemiologic Studies Depressive symptoms scale, UDI= Urogenital Distress Inventory, MMQ= Maudsley Marital Questionnaire, DPQ= Dutch personality Questionnaire, BMI= body mass index, OR= Odds Ratio, 95%CI= 95% confidence interval.

sensitivity and specificity<sup>34</sup>, gives a good indication of depressive symptoms, and is very suitable for large cohort studies.

In non-pregnant women an association is reported between depression and urinary incontinence, especially urge incontinence, and overactive bladder syndrome with (wet OAB) and without urge incontinence (dry OAB)<sup>15-19</sup>. We could not confirm an association of depressive symptoms with either stress nor urge urinary incontinence in or after pregnancy. Nevertheless, we did find an independent relation between depressive symptoms and dry overactive bladder syndrome at 36 weeks gestation, though not one year after delivery.

In univariate analysis many factors we examined were significantly associated with depressive symptoms. However, in logistic regression only several remained independently associated. The size of odds ratios of continuous factors is small compared to the odds ratios of categorical factors, because the chance of having depressive symptoms is expressed per increase of one entity of the continuous factor. The associations we found between psychosocial, behavioral, socioeconomic and biomedical factors at 36 weeks gestation have all been reported before in ante- and postnatal study populations<sup>5, 7, 21, 22, 35-38</sup>.

The etiology of the relation between depressive symptoms and dry overactive bladder syndrome is not clear. Different models are proposed for the association of depressive symptoms with UUI. Firstly urinary incontinence as a chronic disorder may lead to depressive symptoms. The finding that depression at one year after delivery was not associated with (persistent) urinary symptoms does not support this explanation. Secondly it is suggested that psychological factors might influence urgency and detrusor instability<sup>39</sup>. Thirdly, a mutual pathologic origin of urinary incontinence and depression is proposed: both are suggested to be caused by reduction of serotonin<sup>15, 40</sup>. This suggestion is at the least dubious, because serotonergic depletion as suggested etiology in depression has been seriously questioned<sup>41</sup>. Furthermore, the therapeutic effect of selective serotonin reuptake inhibitors (SSRI's) in treatment of depression is only slightly better than placebo<sup>42</sup>.

Serotonin (5HT) and norepinephrine (NE) are found to have a complicated modulating role on urine storage and micturition reflexes. 5HT and NE seem to have an inhibitory effect on bladder activity and a facilitating effect on urethral sphincter activity<sup>43</sup>. These findings have led to the research of 5HT and NE reuptake inhibiting drugs such as duloxetine for treatment of stress urinary incontinence as well as depression<sup>44</sup>. Results are reported to be promising as to increased quality of life in SU1 patients, however, most investigations are conducted in association of pharmaceutical companies and it is unclear whether or not benefits are sustainable<sup>44</sup>. Some research has been done on the modulating role of 5HT receptor antagonists as potential drugs in overactive bladder syndrome<sup>45</sup>. To the best of our knowledge no recent data are available on behavior of serotonin levels in pregnancy. Finally, it has been shown that sleep deprivation in healthy volunteers leads to a markedly increased urine output<sup>46</sup>. According to DSM IV criteria, sleeping problems are part of depressive symptomology. So if depression leads to sleeping problems this may indirectly affect urine output. We could not examine this because we had no information about day and night time micturition frequency of our population. Further

investigation is needed in this area.

The strength of this study is that we used a prospective, longitudinal design with validated questionnaires in healthy nulliparous women. The weakness of the study is the low participation rate. Due to the quantity and intimate nature of other questions on sexuality and pelvic floor discomfort the response rate was but 54%. However, prevalence rates of pelvic floor problems and back pain found in this cohort are in concordance with prevalence rates in other studies and the obstetrical outcome (mode of delivery, birth weight, etc.) of the study population was similar to that of comparable women registered in the Netherlands Perinatal Registry 2001<sup>13, 47, 48</sup>. In addition, the percentage of women scoring above the cut-off score of 16 on the CES-D is similar to that found in a large American study among pregnant women<sup>7</sup>. It is possible that the prevalence of depression is both underestimated, because women suffering from depressive symptoms might be less likely to participate in a study, and overestimated, because some symptoms occurring in depression also occur in pregnancy. Still, we consider this a representative sample of the normal pregnant population for all the above mentioned reasons.

## Conclusion

We found significantly higher rates of depressive symptoms, SUI and dry-OAB during pregnancy than after childbirth. After controlling for other associated factors we found an independent association between depressive symptoms and dry OAB in pregnancy but not with urinary incontinence. A potential mutual etiology of this association might be interesting for future treatment options, but needs to be further investigated.

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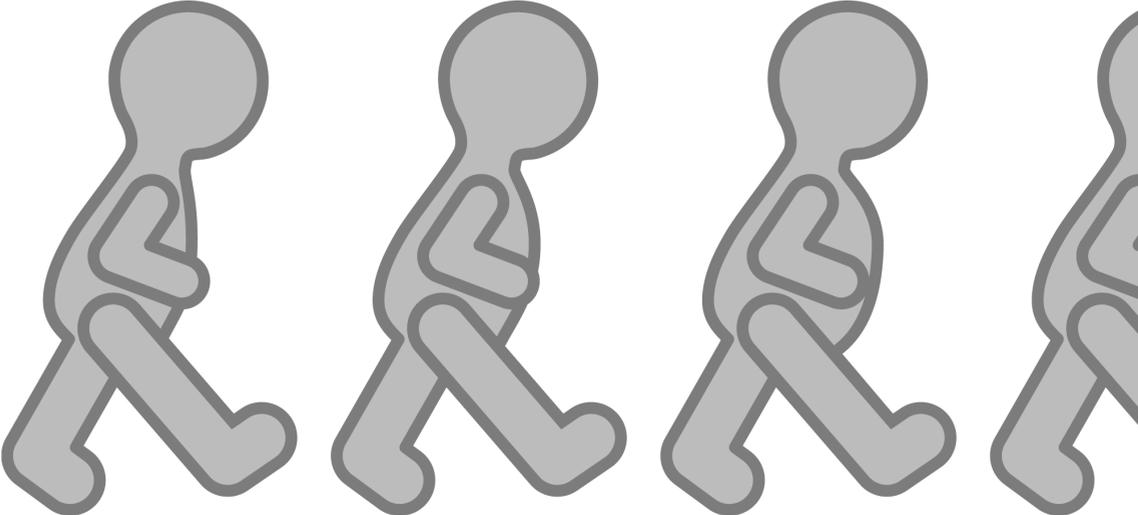
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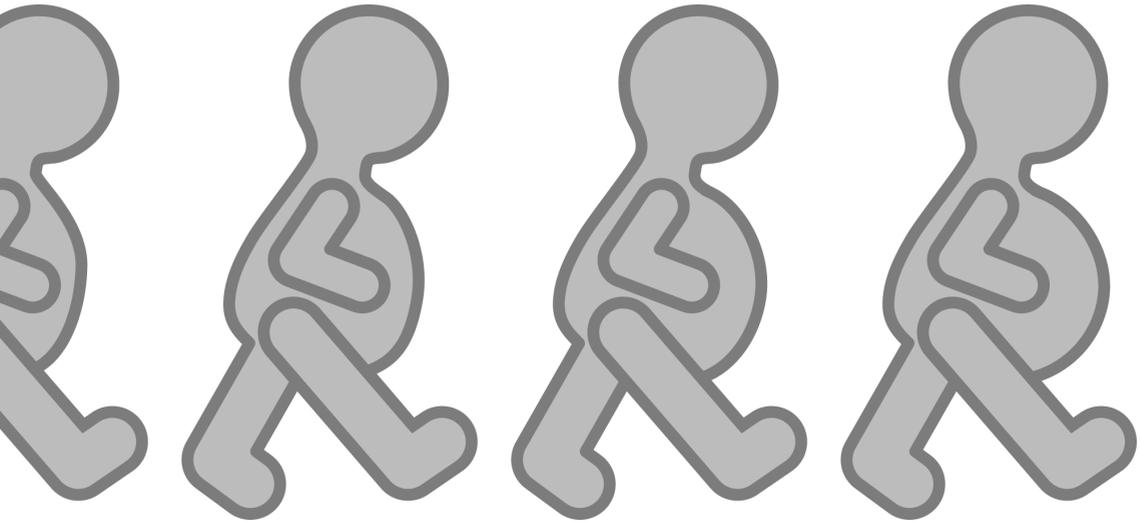
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## Section 4





# Chapter 7

## General discussion

In this thesis several questions regarding pregnancy-related back and pelvic girdle pain, mode of delivery, and depressive and urinary symptoms were addressed. All studies are separate analyses of data obtained through the PRIMIS study.

## Section 1

In section 1 we assessed the prevalence of pregnancy related back pain and so-called pelvic instability and assessed possible associated psychosocial factors. We constructed and validated a questionnaire to determine mobility loss due to pregnancy related back and pelvic girdle pain.

### *Prevalence of back pain and pelvic instability during and after pregnancy*

Back pain before pregnancy was reported by 30% of the women. The prevalence of back pain increased to 50% during pregnancy and decreased after the delivery to pre-pregnancy levels. This is in concordance with other studies<sup>1</sup>.

Pelvic instability (PI) was reported by a total 10% of the women at any time during or after pregnancy. A quarter of these women reported pelvic instability a year after delivery, this is 2.4% of the total study population. The highest prevalence of PI was 7.3% at 36 weeks gestation. Women reporting PI three months after delivery have the highest risk of persistent symptoms: almost half of these women still reported PI twelve months after delivery. The prevalence of PI is not as high as for back pain, but the impact is substantial, especially the loss of mobility.

### *Associated psychosocial factors with back pain during and after pregnancy*

The only variable that remained significantly associated with the presence of back pain in all measurements during and after pregnancy was a pre-pregnancy history of back pain. Obstetrical variables were not associated with the occurrence of back pain after pregnancy. The association of back pain with psychosocial factors was not clear. Some examined factors were found to be independently associated with back pain in logistic regression models, but not consistently present in all measurements. We found an overall percentage of 20.7% of women who scored 16 or higher on the CES-D at 36 weeks gestation, indicating a possible clinical depression. In a large study (n=3472) using the CES-D in pregnancy a similar percentage (20%) was found<sup>2</sup>. Women with back pain at three months after delivery were more likely to have a possible clinical 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. 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 measurements later in pregnancy or after delivery. There was no independent association between back pain and sexual satisfaction or marital status. Married adults in the general population are reported to have less back pain and better general health than other marital status categories<sup>3,4</sup>. An association between marital dissatisfaction, problems in interpersonal relations and sexual problems with back pain is reported in non-pregnant women<sup>5,6</sup>. We could not confirm this in our study on back

pain in pregnancy. A lower self-esteem and feeling inadequate were associated with back pain, but again, not consistently in all measurements. Feelings of inadequacy and low self-esteem are considered to be an indication of a neurotic personality<sup>6</sup>. An association between neuroticism and back pain, especially in its chronic form, is reported<sup>7,8</sup>.

In addition to the fore mentioned psychosocial factors, several biomedical, socio-economic and behavioral factors, such as body mass index, lack of exercise, presence of mild chronic illness, and use of medication were associated with back pain too at some time during or after pregnancy, but not in all measurements. Because of the inconsistency of these findings, they have to be interpreted with caution. If at all any association exists, it is best to consider this as weak. Our data show that a history of back pain is the most important factor for reporting back pain during and after pregnancy. This finding is consistently reported in other studies as well<sup>9-14</sup>.

### *Associated psychosocial factors with pelvic instability during pregnancy*

Depressive symptoms and the personality domain egoism were independently associated with pelvic instability at 36 weeks gestation. Women with PI reported not only more depressive symptoms but also scored more often above the cutoff score of the CES-D, which indicates an clinical depression. The co-existence of depressive symptoms and pain, especially back pain, has a negative effect on the prognosis of back pain<sup>15-18</sup>. Although this association has not been reported before in pregnancy related pelvic girdle pain, and the direction of causality is unclear, it is plausible that these symptoms reinforce each other. It is therefore important to address depressive symptomology and treat them if necessary. Women reporting PI scored significantly higher on the domain egoism of the Dutch Personality Questionnaire. A higher score indicates that these women are more pleased with themselves and do not take notice of others and their troubles<sup>19</sup>. Multiple studies have assessed personality traits and the presence of disease, mostly chronic pain<sup>16</sup>. In chronic pain patients high rates of neuroticism is found<sup>20</sup>. It is tempting to regard certain personalities more vulnerable to disease, especially diseases difficult to comprehend by medics, and for which psychosomatic etiology is suggested. For clinical practice, the implication of the finding that women reporting PI seem more egoistic is not clear.

In addition to these two psychosocial factors, the presence of mild chronic illness such as asthma was also found to be an independently associated factor with pelvic instability. Since this study included only healthy pregnant women, it concerned a minor group of women with only mild co-morbidity, and therefore no conclusions can be drawn from this finding. Obstetric factors in general, and mode of delivery specifically were not associated with pelvic instability.

### *Consequences of pelvic instability*

We found that women reporting pelvic instability are significantly less mobile and more often require crutches and wheelchairs in comparison to women without PI or women with back pain only. Women who reported PI at 36 weeks gestation were more often unable to work due to back and pelvic girdle pain as compared to

women with back pain only (OR 6.7 [2.8-16.2]). In a Dutch study on pregnant employees, about 14% needed more than two weeks sick leave due to musculo-skeletal problems during pregnancy, and about the same percentage after pregnancy<sup>21</sup>. These percentages are higher than our findings (8.2% during and 3.2% after pregnancy). The difference might be caused by unemployment in our population (5.1%) and a somewhat younger population (30.5 versus 32 years). How often women in our study needed sick leave for other reasons than back and pelvic pain, e.g. fatigue, is not known. It is likely that women reporting PI need more sick leave in general than women without PI, because they are significantly less mobile and report a higher prevalence of co-morbidity. This provides besides the individual suffer and loss of mobility an additional socioeconomic reason to treat and monitor these women in the best possible way. Most women with PI received physiotherapeutic treatment, sometimes in combination with a pelvic belt.

### *The Pregnancy Mobility Index*

We constructed and validated a self-report questionnaire for use in a pregnant population to assess mobility in relation to back and pelvic pain. Our data show that the questionnaire is consistent, reliable and able to distinguish between normal and abnormal mobility. Although it is well established that back and pelvic pain symptoms are highly prevalent during pregnancy and it is alleged that it limits mobility, a reliable tool to measure this mobility had not yet been developed. Back pain in pregnancy seems to differ from that in the general population. The incidence increases twofold and a pelvic girdle component is added. Differentiating between back and pelvic pain is often difficult<sup>22</sup>. In addition it is likely that pregnant women with back pain have different mobility patterns and expectations than men and women in the general population. Furthermore, most existing questionnaires do not exclusively focus on mobility, but also encompass additional aspects like pain frequency and social life. The Pregnancy Mobility Index presented here is specifically designed for use in a pregnant population and concerns exclusively mobility in relation to back and pelvic pain. The internal consistency is found to be good to excellent (Cronbach Alpha =0.8 -0.9). The PMI has good construct validity and is adequate in detecting change in mobility, and therefore a useful tool in clinical practice.

## **Section 2**

In section 2 we examined possible associated psychosocial factors for the risk of instrumental and surgical delivery.

Our data show that the majority of the variance of mode of delivery in spontaneous onset term delivery is explained by obstetrical variables like an abnormal presentation, birth weight, gestational age, and, most importantly, fetal distress. Some variance is explained by better quality of the emotional relationship with the partner. We found no independent associations between mode of delivery and depressive symptoms or personality.

Surprisingly, having a better emotional relationship with the partner in late pregnancy is associated with more instrumentally assisted births and emergency cesarean

deliveries. Examining the separate questions of the emotionality scale of the Maudsley Marital Questionnaire in univariate non-parametric analysis, women with non-spontaneous vaginal deliveries perceived more warmth and understanding ( $p=0.005$ ), felt that their partners are more responsible ( $p=0.001$ ) and were more satisfied with their relationship ( $p=0.028$ ) at 36 weeks gestation than women with spontaneous vaginal deliveries.

It is generally agreed that social support and marriage enhance health status and decrease mortality. Two proposed mechanisms are that social support imposes a direct positive effect on health, and alternatively that social support buffers the association between stressors and health<sup>23</sup>. The latter mechanism could theoretically suggest that good social support from the partner buffers the stress that labor imposes on a woman and therefore will result in more spontaneous vaginal parturition. However, our data seem to point in the opposite direction.

We have no good explanation for this finding. It is important to stipulate that our data concern social support from the partner received during pregnancy, and not social support at the time of delivery. It is known that social support during labor is of great influence to the mode of delivery as shows research concerning labor help by a doula<sup>24</sup>.

### Section 3

In this section we investigated the prevalence of and associations between depressive symptoms and dry overactive bladder syndrome and urge and stress urinary incontinence during and after first pregnancy

We assessed the possible association of urinary symptoms with depression, while controlling for psychosocial, behavioral, socioeconomic and biomedical factors. We found a significant increase in prevalence of depressive symptoms, urge urinary incontinence (UUI), stress urinary incontinence (SUI) and dry-overactive bladder (OAB) syndrome during pregnancy, and a significant reduction in prevalence of depressive symptoms, SUI and dry-OAB after childbirth. UUI did not significantly decrease after childbirth. In univariate analysis, urinary incontinence as well as dry OAB syndrome were significant associated with a CES-D score of 16 or above. However, after adjusting for possible confounding factors, only dry OAB syndrome remained significantly associated.

Depressive symptoms, urinary incontinence and overactive bladder syndrome are all highly prevalent during pregnancy. About one in five pregnant women reported symptoms of depression, a similar number as found in an other large study.<sup>2</sup> Depressive symptoms were more prevalent during pregnancy, especially in the third trimester, than postpartum. The prevalence of depressive symptoms in these women prior to their pregnancy is unknown. In non-pregnant women an association is reported between depression and urinary incontinence, especially urge incontinence, and overactive bladder syndrome with (wet OAB) and without urge incontinence (dry OAB)<sup>25-29</sup>. We could not confirm an association of depressive symptoms with either stress nor urge urinary incontinence in pregnancy. Nevertheless, we did find an independent relation between depressive symptoms and dry overactive bladder syndrome.

In univariate analysis many other factors we examined were significantly associated with depressive symptoms. However, in multivariate logistic regression only the quality of the relationship of the women with her partner (both emotionally and sexually), feelings of inadequacy, higher body mass index, low job satisfaction and lack of leisure time physical activity several remained independently associated. The independent associations we found between these psychosocial, behavioral, socioeconomic and biomedical factors have all been reported before in ante- and postnatal study populations<sup>2, 30-36</sup>.

The etiology of the relation between depressive symptoms and dry overactive bladder syndrome is not clear. Different models are proposed for the association of depressive symptoms with UUI. Firstly urinary incontinence as a chronic disorder may lead to depressive symptoms. Secondly it is suggested that psychological factors might influence urgency and detrusor instability<sup>37</sup>. Thirdly, a mutual pathologic origin of urinary incontinence and depression is proposed: both are suggested to be caused by reduction of serotonin response<sup>25, 38</sup>. This suggestion might be interesting for future treatment options, but needs to be further investigated.

To the best of our knowledge no recent data are available on serotonin levels in pregnancy. An old study reports a decrease of blood serotonin concentration in pregnancy<sup>39</sup>.

### *General considerations*

This study is entirely based on validated self-report questionnaires. The advantage is that this provides an opportunity to access a large cohort, without too much nuisance for the participants. We decided not to perform a physical examination and to solely rely on self reported back and pelvic girdle pain, because these symptoms are primarily subjective. In previous studies there was a significant correlation between self reported back pain and clinical findings<sup>40, 41</sup>. Tests used in pregnancy related back and pelvic girdle pain are almost exclusively used by specialized physiotherapist and are hardly used by obstetricians and general practitioners<sup>22, 42, 43</sup>. Referral for treatment is mostly based on anamnestic data.

We utilized the CES-D to assess depressive symptoms. We rather employed the term depressive symptoms than the diagnostic term depression in this study because the CES-D dates from before the DSM IV criteria, and diagnosis of depression could therefore differ from diagnosis obtained through interview following these criteria. In addition, overestimation of prevalence of depression is possible because some depressive symptoms occur more frequent in pregnancy, such as insomnia. However, the CES-D is a widely used questionnaire with adequate sensitivity and specificity,<sup>44</sup> gives a good indication of depressive symptoms, and is suitable for large cohort studies.

Regarding micturition symptoms, we did not perform urodynamic tests. Sensitivity of stress incontinence and urgency/urge urinary incontinence symptoms are reported to be accurate compared to urodynamic tests (90-100% and 62-78% respectively), but specificity is rather low (51-65% and 39-55% respectively), and overestimation of prevalence can occur based on symptoms only<sup>45-47</sup>. However, conventional urodynamic tests tend to underestimate prevalence, mostly due to fluctuation of symptoms over time and nonphysiological circumstances<sup>48</sup>. We followed the

recommendations of the ICS to diagnose micturition symptoms, which are widely used in research settings.

Due to the quantity and intimate nature of questions on sexuality and pelvic floor discomfort the response rate was but 54%. However, prevalence rates of pelvic floor problems, back pain and depressive symptoms found in this cohort are in concordance with prevalence rates in other studies, and the obstetrical outcome of the study population was similar to that of comparable women registered in the Netherlands Perinatal Registry 2001<sup>2, 49-51</sup>. Therefore we consider this cohort as a representative sample of the general nulliparous pregnant population.

## Conclusions

The prevalence of back pain almost doubles in pregnancy in healthy nulliparous women. 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 associated with the additional back pain in pregnancy. Most likely pregnancy itself, with the different aspects of each trimester, is responsible for the added prevalence of back pain in pregnancy.

We developed and validated a new self-report questionnaire to assess mobility in relation to back and pelvic girdle pain (the Pregnancy Mobility Index). The PMI consists of three scales and was specifically designed for use in a pregnant population. The Pregnancy Mobility Index has been shown to be a reliable and valid questionnaire for use during and after pregnancy.

The prevalence of self-reported pelvic instability is at its peak in the last trimester of pregnancy (7.3%). We found that one out of six women with PI at 36 weeks gestation still reports PI one year after delivery. Women with PI have less mobility than women without PI or with back pain only and needed more often sick leave and crutches or wheelchairs. None of the women in this study reporting PI during or after pregnancy needed crutches or wheelchairs one year after delivery. No association was found between PI and obstetrical factors. PI was found to be associated with egoism, co-morbidity and depressive symptoms.

Regarding mode of delivery, we found no protective effect of social support received from the woman's partner during pregnancy, not having depressive symptoms or specific personality traits against instrumentally assisted vaginal birth or emergency caesarean. The best predictive factors for instrumentally assisted vaginal birth or emergency cesarean after spontaneous onset of delivery are higher fetal weight, non occiput presentation and increased gestational age, and foremost fetal distress during parturition.

We found significantly higher rates of depressive symptoms, SUI and dry-OAB during pregnancy than after childbirth. After controlling for other associated factors we found an independent association between depressive symptoms and dry OAB in pregnancy but not with urinary incontinence. A possible mutual etiology of this association might be interesting for future treatment options, but needs to be further investigated.

## Recommendations

Back and pelvic girdle pain are highly prevalent in pregnancy. Although prognosis is generally good, these symptoms, especially so-called pelvic instability, can be very disabling and account for a large part of sick leave during pregnancy. Treatment and prevention programs need to be optimized<sup>52,53</sup>. To accomplish this, there is an urgent need for consensus regarding definitions and terminology.

Women reporting pelvic instability three months after delivery have the highest risk of long-term symptoms and particularly need monitoring and treatment. Normal obstetric procedures can be followed in women reporting back and pelvic girdle pain, since no association is found with obstetric factors.

Concerning the association of depression with overactive bladder syndrome; a possible mutual etiology might be interesting for future treatment options, but needs to be further investigated.

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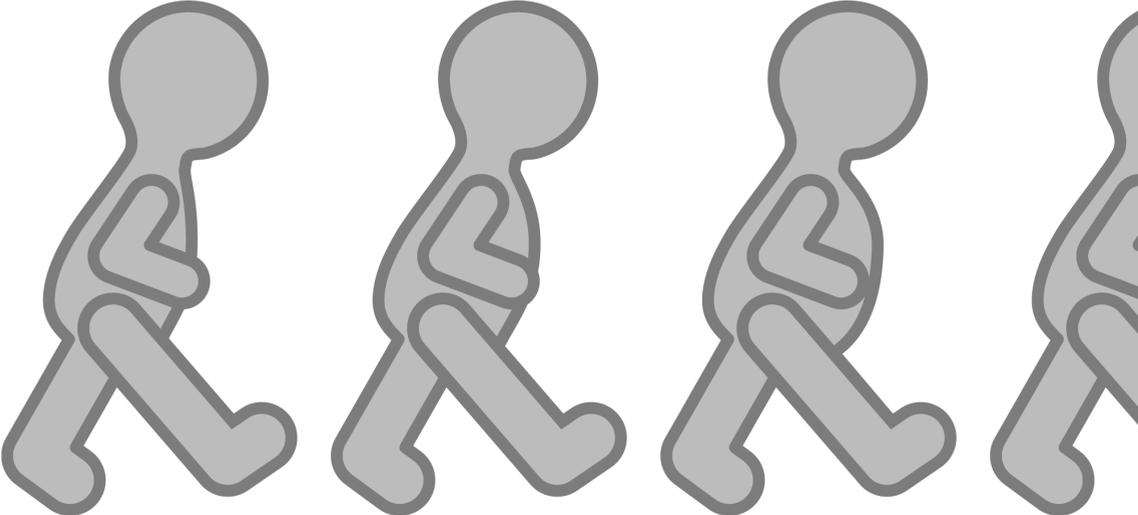
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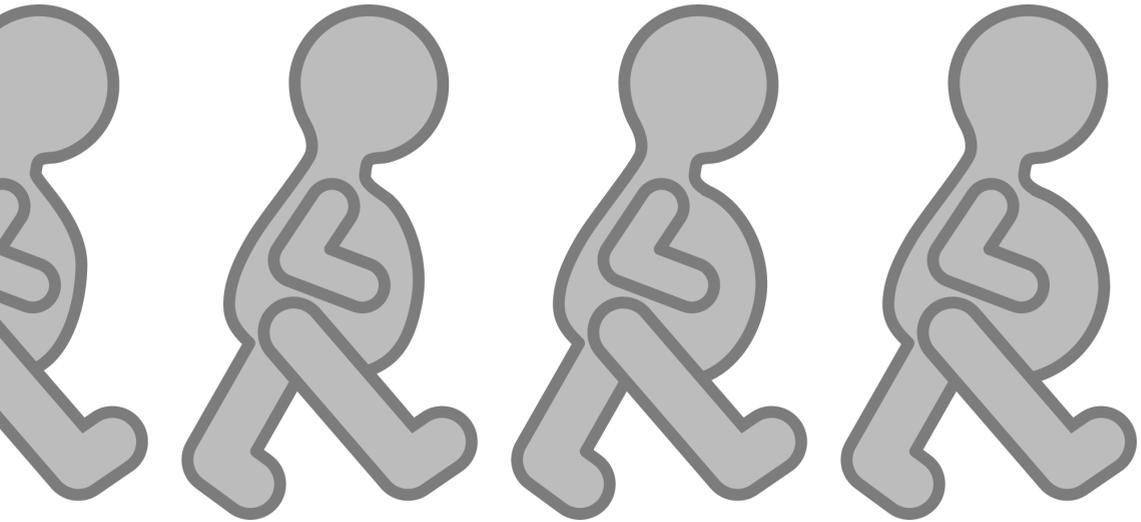
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# Chapter 8

## Summary

This thesis encloses studies which are separate analyses of the PRIMIS Study. In the PRIMIS Study a cohort of healthy women who expected their first child was followed up from early pregnancy to one year after delivery. Self-report questionnaires regarding psychosocial factors, urogenital symptoms and pregnancy related back and pelvic girdle pain were distributed to participants at 12, 24 and 36 weeks gestation, and 3 and 12 months after delivery. Obstetric data were obtained from midwives and gynecologists/obstetricians.

In *Chapter 1* the research questions of this thesis are introduced. Pregnancy and childbirth are both physically and emotionally impressive life events. Pregnancy related symptoms such as back and pelvic girdle pain and depressive and urogenital symptoms are highly prevalent during pregnancy. The investigation of the interaction of physical symptoms and childbirth with psychosocial factors could improve our understanding of pregnancy related problems. An overview of the literature on pregnancy related back and pelvic girdle pain is provided. This led us to the conclusion that its etiology is multicausal and risk factors need further investigation. Emergency cesarean and instrumental vaginal birth impose greater physical and emotional morbidity and mortality on both mother and infant than normal vaginal delivery. It is important to identify factors that are associated with the risk of assisted delivery. We set out to examine the influence of psychosocial factors on pregnancy related back and pelvic girdle pain and mode of delivery. In addition we made an inventory of the Dutch situation regarding self reported so called “pelvic instability” and presented a mobility scale, designed for use in pregnancy. Finally, we assessed the association between depressive symptoms and urinary symptoms. In *Chapter 2* we assessed the prevalence and associated factors of pregnancy related back and pelvic girdle pain. We included psychosocial factors as possible associated factors, controlling for confounding factors. In a longitudinal cohort study design we included 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. 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. In *chapter 3* a mobility questionnaire is presented designed for assessing disability due to pregnancy related back and pelvic girdle pain: the Pregnancy Mobility Index (PMI). The PMI consists of items concerning day-to-day activities selected through literature research and clinical experience. Participating women completed the questionnaire at 12 and 36 weeks gestation and one year after delivery. Reliability, construct and criterion validity were tested. The Pregnancy Mobility Index has been shown to be a reliable and valid questionnaire well suited for use during and after pregnancy.

In *Chapter 4* we made an inventory of the prevalence and consequences of so-called pelvic instability during and after pregnancy in the Netherlands. Possible associated psychosocial and delivery-related factors were identified.

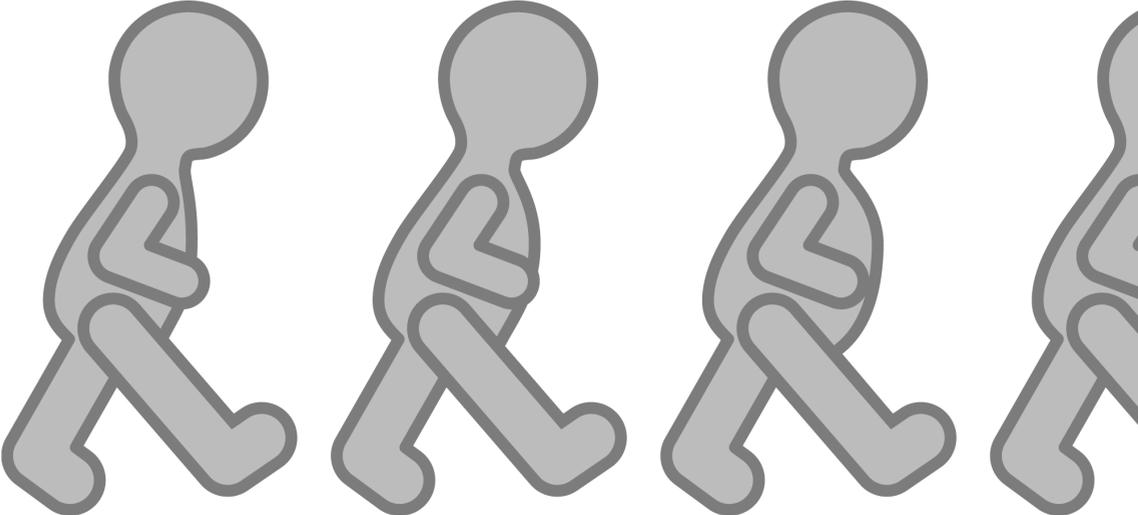
Women expecting their first child answered questionnaires regarding pelvic instability, and biomedical, sociodemographic, behavioral and psychosocial factors at 12 and 36 weeks gestation and three and twelve months after delivery. Additionally, birth records were obtained. Possible associated variables with were studied using non parametric tests. The incidence of self-reported pelvic instability was highest in late pregnancy (7.3%). One out of six women suffering from pelvic girdle pain at 36 weeks gestation and almost half of the women suffering from pelvic girdle pain three months after delivery still reported symptoms one year after delivery. Women reporting pelvic girdle pain are less mobile than women without pain or women suffering from back pain only and more frequently have to use wheelchairs or crouches. No association was found between delivery-related factors and pelvic instability. Women with pelvic instability reported more co-morbidity and depressive symptoms. We provided the following recommendations. Women reporting pelvic instability can follow normal obstetric procedures. Prognosis is generally good, however women reporting pelvic girdle pain three months after delivery need extra consideration. Attention needs to be given to psychosocial factors, in particular depressive symptoms.

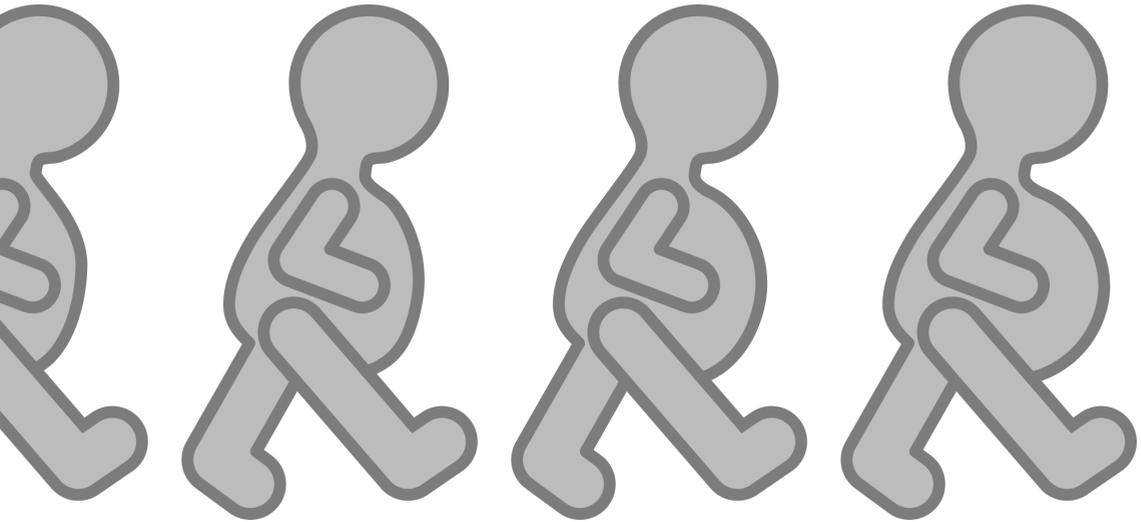
In *Chapter 5* we examined what factors are associated with the risk for instrumental and surgical delivery. In addition to biomedical and fetal factors we included psychosocial factors such as depressive symptoms, quality of the relationship of the woman with her partner, personality, lifestyle and educational level. We assessed healthy nulliparous pregnant women with a child in vertex presentation and spontaneous onset of term labor using validated questionnaires.

We found that social support from the woman's partner in pregnancy, lack of depressive symptoms and specific personality traits are not protective against instrumentally assisted vaginal birth or emergency cesarean section. Most predictive factors for instrumentally assisted vaginal birth or emergency cesarean after spontaneous onset of delivery are fetal weight, non-occiput anterior presentation and gestational age, and foremost fetal distress during parturition.

In *Chapter 6* we investigated the prevalence of depressive symptoms, dry overactive bladder (OAB) syndrome and urge and stress urinary incontinence (UUI and SUI) using the Center for Epidemiologic Studies Depressive symptoms scale (CES-D) and the Urogenital Distress Inventory (UDI). In addition we investigated the association of depressive symptoms with urinary incontinence and dry overactive bladder syndrome, controlling for confounding socioeconomic, psychosocial, behavioral and biomedical factors. Our data show a significant increase in prevalence of depressive symptoms, UUI, SUI and dry-OAB during pregnancy, and in a significant reduction in prevalence of depressive symptoms, UUI and dry-OAB after childbirth. SUI did not significantly decrease after childbirth. In univariate analysis urinary incontinence as well as dry OAB syndrome were significant associated with a CES-D score of 16 or above. However, after adjusting for possible confounding factors, only dry OAB syndrome remained significantly associated. A potential mutual etiology of this association is suggested by previous studies and might be interesting for future treatment options, but needs to be further investigated.

*Chapter 7* contains the general discussion and recommendations for clinical practice.





## Appendices



## I. Samenvatting

Dit proefschrift omvat een aantal separate analyses van de PRIMIS-studie. Voor deze studie werd tussen januari 2002 en juli 2003, via tien verloskundigenpraktijken in de regio Utrecht een groep vrouwen die hun eerste kind verwachtten gerekruteerd. Zij werden vanaf het begin van de zwangerschap tot een jaar na de bevalling gevolgd. De participanten beantwoordden vragenlijsten over psychosociale factoren (depressieve klachten, relatie met de partner en persoonlijkheid), urogenitale symptomen (betreffende urineren, ontlasting en seksualiteit), en rug- en bekkengordelpijn. De vragenlijsten werden verstuurd bij 12, 24 en 36 weken zwangerschap en 3 en 12 maanden na de bevalling. Gegevens over de bevalling werden verkregen via de betrokken verloskundige of gynaecoloog.

In *Hoofdstuk 1* worden de onderzoeksvragen gepresenteerd. Zwangerschap en bevalling zijn fysiek en emotioneel aangrijpende gebeurtenissen. Aan zwangerschap gerelateerde klachten zoals rug- en bekkengordelpijn en depressieve en urogenitale symptomen komen vaak voor. Uit onderzoek, verricht in een niet zwangere populatie blijkt steeds meer de invloed van psychosociale factoren op het ontstaan en persisteren van fysieke klachten. Door de interactie te onderzoeken tussen psychosociale factoren, fysieke symptomen en de bevalling, kunnen we ons begrip van aan zwangerschap gerelateerde klachten vergroten.

In dit hoofdstuk wordt eerst een overzicht gegeven van eerdere studies over rug en bekkengordelpijn tijdens en na de zwangerschap. Hieruit volgt de conclusie dat de etiologie van deze klachten veelvuldig is en dat er weinig bekend is over de rol van psychosociale factoren bij het ontstaan van deze klachten. Verder is bekend dat een spoedkeizersnede en een vaginale kunstverlossing (vacuüm- en tangverlossing) meer kans geven op fysieke en emotionele schade en sterfte bij moeder en kind dan een spontane vaginale bevalling. Daarom is het belangrijk factoren te identificeren die geassocieerd kunnen worden met een niet natuurlijke bevalling. In dit onderzoek werd de invloed van psychosociale factoren op rug- en bekkengordelpijn tijdens de zwangerschap en de manier van bevallen bestudeerd. Ook onderzochten wij de Nederlandse situatie omtrent zogenoemde bekkeninstabiliteit en presenteerden wij een mobiliteitsschaal voor zwangere vrouwen. Als laatste werd de associatie tussen depressieve en urogenitale symptomen onderzocht.

In *Hoofdstuk 2* beschrijven wij de prevalentie en de factoren die worden geassocieerd met aan de zwangerschap gerelateerde rug- en bekkengordelpijn. Als mogelijk geassocieerde factoren werden ook psychosociale variabelen onderzocht. Voor mogelijk versturende factoren werd gecorrigeerd. 672 vrouwen met een laagrisico eerste eenling zwangerschap werden gevolgd vanaf 12 weken zwangerschap tot een jaar na de bevalling. De deelnemers ontvingen vragenlijsten bij 12 en 36

weken zwangerschap en 3 en 12 maanden na de bevalling. De vragen betroffen niet alleen leefgedrag en biomedische en sociodemografische factoren, maar ook psychosociale factoren: depressieve klachten, persoonlijkheid en de kwaliteit van de relatie met de partner. De meest voorspellende factor voor rugpijn tijdens en na de zwangerschap bleek de aanwezigheid van rugpijn voor de zwangerschap. Er werd geen duidelijke associatie gevonden tussen rugpijn tijdens en na de zwangerschap en psychosociale factoren.

In *Hoofdstuk 3* wordt een mobiliteitsschaal ontworpen waarmee verlies aan mobiliteit door zwangerschapsgelateerde rug- en bekkengordelpijn kan worden onderzocht: de Pregnancy Mobility Index (PMI). De PMI bestaat uit items betreffende activiteiten uit het dagelijks leven die werden geselecteerd na onderzoek van de literatuur over dit onderwerp en klinische ervaring. Deelnemende vrouwen vulden vragenlijsten in bij een zwangerschapsduur van 12 en 36 weken en 3 en 12 maanden na de bevalling. De schaal werd op verschillende manieren getest en bleek betrouwbaar en valide te zijn voor het meten van mobiliteit tijdens en na de zwangerschap.

In *Hoofdstuk 4* worden de prevalentie en gevolgen van zelfgerapporteerde bekkeninstabiliteit in een populatie van gezonde vrouwen die hun eerste kind verwachten geïnventariseerd. Ook psychosociale en bevallingsgerelateerde factoren die mogelijk met bekkeninstabiliteit kunnen worden geassocieerd, worden in dit hoofdstuk geïdentificeerd. 412 vrouwen beantwoordden vragenlijsten bij 12 en 36 weken zwangerschapsduur en 3 en 12 maanden na de bevalling over bekkeninstabiliteit, rugpijn, levensstijl en biomedische, socio-demografische en psychosociale factoren. Gegevens over de bevalling werden verkregen via de betrokken verloskundige of gynaecoloog. Mogelijk met bekkeninstabiliteit geassocieerde factoren werden onderzocht met behulp van niet-parametrische testen. De incidentie van bekkeninstabiliteit was maximaal aan het einde van de zwangerschap (7.3%). Een op de zes vrouwen met bekkeninstabiliteit bij 36 weken zwangerschap en bijna de helft van de vrouwen met bekkeninstabiliteit 3 maanden na de bevalling, gaf een jaar na de bevalling nog steeds klachten aan. Vrouwen met bekkeninstabiliteit waren minder mobiel dan vrouwen zonder bekkeninstabiliteit of met alleen rugpijn. Zij gebruikten vaker krukken of een rolstoel en meldden zich frequenter ziek. Er werd geen associatie gevonden van bekkeninstabiliteit met partusgerelateerde factoren. Vrouwen met bekkeninstabiliteit maakten bovendien vaker melding van andere niet ernstige ziekten en depressieve symptomen.

Uit dit onderzoek blijkt dat artsen en verloskundigen vrouwen met bekkeninstabiliteit het gebruikelijke verloskundig beleid kunnen bieden. De prognose van bekkeninstabiliteit is over het algemeen goed. Voor vrouwen die drie maanden na de bevalling nog aangeven last te hebben van bekkeninstabiliteit, geldt echter een slechtere prognose. Zij dienen intensiever begeleid te worden. Tevens dient bij deze groep aandacht te worden besteed aan psychosociale aspecten, en in het bijzonder aan depressieve klachten.

In *hoofdstuk 5* werd onderzocht welke factoren geassocieerd zijn met het risico op een vaginale kunstverlossing (vacuüm- en tangverlossing) of spoedkeizersnede. Naast biomedische variabelen en kenmerken van de baby analyseerden wij depressieve klachten, leefgedrag, opleidingsniveau en de kwaliteit van de relatie met de partner persoonlijkheid. Gezonde vrouwen, die in verwachting waren van hun eerste kind (in hoofdligging), met een spontaan begin van de bevalling, werden onderzocht met gevalideerde vragenlijsten. Wij vonden dat een goede emotionele relatie met de partner, het ontbreken van depressieve klachten en een aantal specifieke persoonlijkheidskenmerken niet beschermend zijn voor een vaginale kunstverlossing of spoedkeizersnede. De meest voorspellende factoren voor een vaginale kunstverlossing of een spoedkeizersnede na een spontaan begin van de bevalling bleken het gewicht van de baby, abnormale positie van het hoofd bij de bevalling (anders dan achterhoofdsligging met achterhoofd achter), de duur van de zwangerschap en, als belangrijkste, de verdenking van de gynaecoloog op een slechte toestand van de baby tijdens de bevalling.

In *Hoofdstuk 6* wordt de prevalentie van depressieve symptomen, overactieve blaasklachten (vaak moeten urineren en sterke aandrang om te urineren) en urge-incontinentie (urineverlies bij sterke aandrang) en stress-incontinentie (urineverlies bij drukverhogende momenten zoals hoesten) geëvalueerd met behulp van twee vragenlijsten (the Center for Epidemiologic Studies Depressive Symptoms Scale (CES-D) and the Urogenital Distress Inventory (UDI). Verder werd de associatie tussen depressieve klachten met urine-incontinentie en overactieve blaasklachten onderzocht. Hierbij werd voor factoren als levensstijl en biomedische, socio-demografische en psychosociale factoren gecorrigeerd. Uit deze onderzoeksgegevens bleek dat de prevalentie van zowel depressieve klachten als van alle plasklachten significant stijgt tijdens de zwangerschap, en dat het aantal depressieve symptomen, urge-incontinentie en overactieve blaasklachten na de bevalling significant daalt. Alleen het aantal gevallen van stress-incontinentie daalt niet significant na de bevalling. Urine-incontinentie en overactieve blaasklachten bleken in eerste instantie significant geassocieerd te zijn met depressieve symptomen, maar na correctie voor andere factoren bleken alleen overactieve blaasklachten met depressiviteit samen te hangen. In een ander onderzoek werd een mogelijk gemeenschappelijke oorzaak van beide symptomen gesuggereerd. Dit kan interessant zijn voor toekomstige behandelingsopties, maar moet eerst nader worden onderzocht.

In *Hoofdstuk 7* worden de bevindingen van dit proefschrift bediscussieerd en geven wij enkele aanbevelingen voor de klinische praktijk.



## II. Questionnaires - vragenlijsten (in Dutch)

### Center for Epidemiologic Studies Depression Scale

*Gedurende de afgelopen week:*

1. Stoorde ik me aan dingen die me gewoonlijk niet storen
2. Had ik geen zin in eten, was mijn eetlust slecht
3. Bleef ik maar in de put zitten, zelfs als familie of vrienden probeerden me eruit te halen
4. Voelde ik me even veel waard als ieder ander
5. Had ik moeite mijn gedachten bij mijn bezigheden te houden
6. Voelde ik me gedeprimeerd
7. Had ik het gevoel dat alles wat ik deed moeite kostte
8. Had ik goede hoop voor de toekomst
9. Vond ik mijn leven een mislukking
10. Voelde ik me bang
11. Sliep ik onrustig
12. Was ik gelukkig
13. Praatte ik minder dan gewoonlijk
14. Voelde ik me eenzaam
15. Waren de mensen onaardig
16. Had ik plezier in het leven
17. Had ik huilbuien
18. Was ik treurig
19. Had ik het gevoel dat mensen me niet aardig vonden
20. Kon ik maar niet op gang komen

Antwoordmogelijkheden: zelden of nooit (minder dan 1 dag), soms of weinig (1-2 dagen), regelmatig (3-4 dagen), meestal of altijd (5-7 dagen).

## Nederlandse Persoonlijkeids Vragenlijst

1. Ik ben tevreden met het werk dat ik doe.
2. Ik vind het vervelend een groep onbekende mensen toe te spreken.
3. Als je vader en moeder oud worden, heb je de plicht voor ze te zorgen.
4. Het stoort mij als vrouwen alleen in een café zitten.
5. Als ik eenmaal een besluit genomen heb, blijf ik erbij.
6. Af en toe ben ik zo slecht gehumeurd, dat niemand het mij naar de zin kan maken.
7. In de omgang met onbekende mensen voel ik me zeker van mezelf.
8. Een regelmatig leven bevalt mij het best.
9. Wanneer mensen veel van mij eisen blijf ik meestal rustig.
10. Ik vind het leven vaak zinloos.
11. In een groep heb ik meestal de leiding.
12. Ik denk dat mensen vaak liegen als ze in moeilijkheden zitten.
13. Als ik ergens mee bezig ben, dwalen mijn gedachten vaak af.
14. Ik kan lang achter elkaar doorwerken.
15. Voor elke moeilijkheid is maar een oplossing de beste.
16. Ik begin pas ergens aan als ik weet hoe het zal aflopen.
17. Als je stemt heb je je plicht als Nederlander gedaan.
18. Als mensen moeilijk kunnen beslissen, vragen ze mij om raad.
19. Ik heb het gevoel, dat de mensen mij als een kind behandelen.
20. Soms ben ik zo opgewonden, dat ik mijn stem niet meer kan beheersen.
21. Ik ben vaak eerlijk, omdat ik niet de kans wil lopen door de mand te vallen.
22. Als je iets doet voor een onbekende, behoor je ervoor betaald te worden.
23. Ik ben vaak zenuwachtig.
24. Als het er op aankomt, laten veel mensen je in de steek.
25. Op feestjes breng ik graag de stemming erin.
26. Ik kan goed met andere mensen omgaan.
27. Ik vind belasting ontduiken net zo erg als diefstal.
28. Er zijn maar weinig mensen, die mij begrijpen.
29. Ik ben vaak uit mijn humeur zonder dat ik weet waarom.
30. Als je vriendjes hebt bij de overheid, word je daar vlotter geholpen.
31. Ik vind het vervelend met onbekenden te praten.
32. Ook zonder vrienden kan ik gelukkig zijn.
33. Als ik veel mensen ga ontmoeten, word ik zenuwachtig.
34. Er zijn mensen die graag zouden willen, dat ik moeilijkheden kreeg.
35. Ik voel me meestal opgewekt.
36. Ik vind het moeilijk contact te leggen met onbekenden.
37. Ik zit vaak in de put.
38. Ik denk dat les geven mij wel ligt.
39. Ik doe me vaak anders voor dan ik ben.
40. Ik houd mijn spullen graag netjes in orde.
41. Ik vind dat arme landen zichzelf moeten redden.
42. Ik maak me gauw druk over kleinigheden.

43. Als het even kan vermijd ik recepties.
44. Ik laat me weinig beïnvloeden door andere mensen.
45. Er komt veel werk uit mijn handen.
46. Ik doe wat de mensen van mij verwachten.
47. In gezelschap van onbekende mensen ben ik verlegen.
48. Ik vind het vervelend veel mensen om mij heen te hebben.
49. Ik erger me aan de fouten van andere mensen.
50. Ik maak moeilijk nieuwe vrienden.
51. Je kunt maar het beste vertrouwen op je eigen gezonde verstand.
52. Het werk gaat mij voor alles.
53. Het laat me koud hoe de mensen over mij denken.
54. Ik vind dat veel mensen onverschillig zijn.
55. Als je wat voor een ander doet, krijg je vaak stank voor dank.
56. Ik heb een goede kijk op andere mensen.
57. Ik doe mijn best om moeilijkheden zoveel mogelijk te vermijden.
58. Ik trek me weinig aan van kritiek.
59. Ook bij kleinigheden moet ik eerst nadenken voor ik wat doe.
60. Ik vraag alleen dan iemand om hulp wanneer het niet anders kan.
61. Als ik uit mijn dagelijkse regelmaat word gehaald, hindert mij dat.
62. Ik vind dat iemand die de wet overtreedt, gestraft moet worden.
63. Ik word gauw moe.
64. Ik neem graag voor anderen beslissingen.
65. Ik neem kwesties van goed en kwaad zwaar op.
66. Ik erger mij aan mensen, die praten over dingen waar ze geen verstand van hebben.
67. Ik zie bezoek liever gaan dan komen.
68. Ik houd van actie.
69. Ik kan mijn gewoonten gemakkelijk veranderen.
70. Ik kan liegen zonder dat iemand iets merkt.
71. Tot nu toe is mij bijna alles gelukt wat ik wilde.
72. Ik voel me vaak nutteloos.
73. In een groep mensen houd ik me liever op de achtergrond.
74. Als ik in spanning zit, heb ik vaak een brok in mijn keel.
75. Als ik met vakantie ben, kan ik mijn werk moeilijk vergeten.
76. Volgens mij komen de beste bruggenbouwers uit ons land.
77. Veranderingen in het weer hebben weinig invloed op mij.
78. Ik praat graag mee over belangrijke problemen.
79. Ik kan slecht tegen sombere mensen.
80. Wanneer ik mijn leven nog eens over zou moeten doen, zou ik het net zo doen.
81. Er zijn maar weinig mensen, waar ik iets van kan leren.
82. Erg vriendelijke mensen wantrouw ik.
83. Alleen bij mensen die ik goed ken, voel ik mij op mijn gemak.
84. De moeilijkheden van andere mensen kunnen mij weinig schelen.
85. Ik heb het geluk dat ik veel invloed heb op andere mensen.

86. Ik kan in korte tijd veel werk doen.
87. Ik vind de mensen vaak te oppervlakkig.
88. Ik heb de indruk dat de mensen vaak over mij roddelen.
89. Op andere mensen heb ik weinig invloed.
90. Ik houd ervan alles van tevoren nauwkeurig te regelen.
91. Zelfs over de moeilijkste zaken kan ik een beslissing nemen.
92. Ik vind dat de mensen vaak onbeleefd zijn.
93. Ik vind het belangrijk om mijn eigen mening door te zetten.
94. Er is meestal veel gepraat nodig, om mensen te overtuigen als ze ongelijk hebben.
95. Ik werk liever alleen dan met een aantal mensen samen.
96. Ik vind dat de mensen zich teveel met mij bemoeien.
97. Ik droom vaak over dingen die ik liever voor mijzelf houd.
98. Het laat me koud of de mensen slordig gekleed zijn.
99. Vaak valt het mij tegen wat zogenaamde vakmensen er in de praktijk van terechtbrengen.
100. Ik houd ervan opdrachten te geven.
101. Als ik op reis zal gaan, voel ik me ontspannen.
102. Ik werk graag snel.
103. Ik heb voor veel dingen belangstelling.
104. Ik heb vaak het gevoel dat alles me mislukt.
105. Ik kan goed tegen een grapje.
106. Ik doe vaak dingen waarvan ik spijt heb.
107. Ik laat me graag door andere mensen bedienen.
108. Als ik me niet lekker voel, ben ik prikkelbaar.
109. Ik moet lang van tevoren weten, waar ik aan toe ben.
110. Als ik iets wil bereiken, zet ik meestal door.
111. Ik wil dat thuis alles op een vaste plaats ligt.
112. Ik ben meestal ergens mee bezig.
113. Soms ben ik zo onrustig, dat ik niet stil kan blijven zitten.
114. Ik regel mijn werk precies.
115. Het kost me moeite om van een eenmaal gemaakt plan af te wijken.
116. Ik heb weinig behoefte aan contact met andere mensen.
117. Ik vind dat je de meeste mensen niet kunt vertrouwen.
118. Ik heb vaak een hekel aan mezelf.
119. Ik vertrouw de mensen pas als ik ze goed ken.
120. Ik vind het zinloos me in te spannen om de maatschappij te verbeteren.
121. Plannen maak ik het liefst alleen.
122. Als de mensen naar mij kijken, word ik verlegen.
123. Ik doe mijn werk meestal met plezier.
124. Het leven is vaak moeilijk voor mij.
125. Ik heb nogal eens het gevoel, dat ik anderen tot last ben.
126. Ik kan mijn problemen zelf wel aan.
127. Ik praat meestal met een luide stem.
128. Niemand hoeft me te vertellen hoe ik mijn werk moet doen.

- 129. Als mensen ruzie hebben, bemoei ik me er meestal mee.
- 130. Ik vind dat iedereen voor zich zelf moet zorgen.
- 131. Mensen die altijd twifelen ergeren mij.
- 132. Ik blijf graag bij oude vertrouwde gewoonten.
- 133. Ik ga het liefst alleen op vakantie.

Antwoordmogelijkheden: juist, ? of onjuist.

## Maudsley Marital Questionnaire

1. Is uw partner voor U als persoon aantrekkelijk (afgezien van lichamelijke aantrekkelijkheid)?
2. Krijgt U genoeg warmte en begrip van uw partner?
3. Bent U tevreden over het aantal keren dat u geslachtsgemeenschap hebt?
4. Hoe vaak heeft U de laatste maand met uw partner geslachtsgemeenschap gehad?
5. Neemt uw partner zijn deel van de verantwoordelijkheid in het huwelijk/ de relatie op zich?
6. Hoe tevreden bent U met hoe vaak U elkaar knuffelt, kust en aanraakt?
7. Bent U tevreden over de vrije tijd die U tezamen doorbrengt?
8. Hoe vaak bereikt U tijdens sex met uw partner een hoogtepunt (bij geen geslachtsgemeenschap 8 omcirkelen).
9. Hoe vaak denkt U eraan van uw partner te scheiden ?
10. Als U een woordenwisseling hebt kunt U dan tot een overstemming komen.
11. Hoe vaak is er sprake van bekvechten, gevit, spanningen, koele verstandhouding of geweld tussen U beiden?
12. Heeft U het gevoel dat uw partner een goede of een slechte echtgenoot is?
13. Kunt U uw partner zoveel vertellen als U wilt?
14. Hoe tevreden bent U over het leven met uw partner (afgezien van seks)?
15. In hoeverre geniet U van seks met uw partner?

Antwoordmogelijkheden: schaal van 0 (zeer positief antwoord) tot 8 (zeer negatief antwoord).

## Pregnancy Mobility Index

Heeft U klachten in het bekken of in de rug bij de volgende activiteiten:

1. Opstaan uitzittende positie
  - a. uit harde stoel
  - b. uit zachte bank
2. Opstaan
  - a. van de vloer
  - b. uit bed
3. Spullen oppakken van de grond
4. Schoenen aan en uittrekken
5. Omdraaien in bed
6. Zitten gedurende een half uur:
  - a. Op bed
  - b. Op een harde(hoge) stoel
  - c. Op een bank
7. Staand werken gedurende een half uur
8. Op de hurken zitten
9. Werken op de knieën
10. 10 minuten stofzuigen
11. Vullen en legen van de wasmachine
12. Was ophangen
13. Tillen:
  - a. tot 5 kg
  - b. 5- 10 kg
14. Lopen:
  - a. afstand van 50 meter
  - b. afstand van 200 meter
  - c. afstand van 500 meter
  - d. hobbelig gebied
  - e. traplopen
15. Vervoer
  - a. autorijden
  - b. met de bus
  - c. met de trein
  - d. met de fiets

Antwoordmogelijkheden: geen klachten/normaal, enige moeite, veel moeite, niet uitvoerbaar of met hulp van anderen.

## Urogenital Distress Inventory

1. Vindt u dat u vaak moet plassen?
2. Als u moet plassen voelt u dan altijd een sterke aandrang?
3. Heeft u ongewenst urineverlies als u aandrang voelt om te plassen?
4. Heeft u ongewenst urineverlies bij lichamelijke inspanning, hoesten of niezen?
5. Heeft u wel eens ongewenst urineverlies zonder dat u aandrang voelt of zonder dat u zich lichamenlijk inspant?
6. Verliest u ongewenst wel eens kleine hoeveelheden urine (druppels)?
7. Verliest u ongewenst wel eens grote hoeveelheden urine?
8. Moet u 's nachts meerdere keren plassen?
9. Plast u wel eens in uw bed?
10. Heeft u moeite uw blaas leeg te plassen?
11. Heeft u wel een het gevoel dat de blaas na het plassen niet helemaal leeg is?
12. Heeft u wel eens een drukkend gevoel onder in de buik?
13. Heeft u wel eens pijn tijdens het plassen?
14. Heeft u wel eens pijn onder in de buik of in de schaamstreek?
15. Heeft u wel eens een zwaar of drukkend gevoel in het bekken gebied?
16. Heeft u wel eens het gevoel dat er iets uit de vagina stulpt?
17. Heeft u wel eens gezien dat er iets uit de vagina stulpt?
18. Heeft u wel eens een ongemakkelijk gevoel in het bekken gebied als u staat of als u zich lichamenlijk inspant?
19. Moet u wel eens tegen de vaginawand drukken om uw ontlasting kwijt te raken?

Antwoordmogelijkheden: ja- nee. Zo ja, hoeveel last heeft u hier van: helemaal niet, een beetje, nogal, heel erg.

### III. Abbreviations

5HT	Serotonin
95% CI	95% Confidence Interval
CES-D	Center for Epidemiologic Studies Depression scale
BMI	Body Mass Index
DPQ	Dutch Personality Questionnaire
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders
ICS	International Continence Society
MMQ	Maudsley Marital Questionnaire
OR	Odds Ratio
NE	Norepinephrine
OAB	Overactive Bladder symptoms
PI	Pelvic Instability
PMI	Pregnancy Mobility Index
SD	Standard Deviation
SSRI	Selective Serotonin Reuptake Inhibitors
SUI	Stress Urinary Incontinence
UDI	Urogenital Distress Inventory
UI	Urinary Incontinence
UUI	Urge Urinary Incontinence



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## V. Dankwoord

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Mijn co-schap gynaecologie in het Rijnstate Ziekenhuis te Arnhem wekte mijn belangstelling voor de gynaecologie. Ik dank de maatschap voor het vertrouwen dat ze altijd in mij had en de prettige werksfeer. Lieve Karin Aalders, jij vooral was de aanstichter van de samenwerking met het UMCU waardoor ik in dit onderzoek rolde. Bedankt voor je steun, ik hoop je nog op veel bekkenbodemcongressen tegen te komen.

Collega arts-assistenten en stafleden Gynaecologie van het St. Elisabeth Ziekenhuis te Tilburg dank ik voor de tintelende ambiance die stimuleert en motiveert. Ik zie het als een voorrecht om bij en met jullie mijn opleiding te mogen volgen.

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## VI. Curriculum Vitae

Geerte van de Pol werd op 6 mei 1975 geboren te Zeist.

Zij deed in 1993 eindexamen Voorbereidend Wetenschappelijk Onderwijs aan de Rijks Scholen Gemeenschap te Winterswijk. Vervolgens behaalde zij haar propedeuse Geschiedenis aan de Rijksuniversiteit Utrecht. In 1994 begon zij aan de studie Geneeskunde en ontving haar artsdiploma in 2001.

Tijdens haar co-schap gynaecologie in het Rijnstate ziekenhuis te Arnhem verrichtte zij samen met H.J. van Brummen wetenschappelijk onderzoek, onder begeleiding van Drs C.I.M. Aalders en Dr. C.H. van der Vaart naar twee soorten verzakingsoperaties.

In 2001 werkte de auteur als arts-assistent gynaecologie in het Meander Medisch Centrum te Amersfoort, alwaar zij na korte tijd vertrok voor een positie als arts-assistent gynaecologie in het Rijnstate Ziekenhuis te Arnhem (opleider Dr.A.Huisman). In februari 2004 werd de eerdere samenwerking met Pien van Brummen en Huub van der Vaart weer opgepakt en startte zij het onderzoek dat leidde tot deze dissertatie.

Sinds januari 2006 werkt zij als gynaecoloog in opleiding in het St. Elisabeth ziekenhuis te Tilburg bij opleider Dr. H.A.M. Vervest.



## VII. List of publications

by august 2006

Sacrospinous hysteropexy compared to vaginal hysterectomy as primary surgical treatment for a descensus uteri: effects on urinary symptoms.

H.J.van Brummen, G. van de Pol, C.I.M. Aalders A.P.M. Heintz, C.H. van der Vaart  
International Urogynecology Journal of Pelvic Floor Dysfunction 2003  
Nov;14(5):350-355

OAB syndrome during and anfter first pregnancy: associated risk factors and effect on the quality of life.

H.J.van Brummen, H.W. Bruinse, G. van de Pol, A.P.M. Heintz, C.H. van der Vaart  
Neurourology and urodynamics 2005; abstract 24 (5/6): 470-471

What is the effect of overactive bladder symptoms on woman's quality of life during and after first pregnancy?

H.J.van Brummen, H.W. Bruinse, G. van de Pol, A.P.M. Heintz, C.H. van der Vaart  
British Journal of Urology International 2006 Feb;97(2):296-300.

Defecatory symptoms during and after the first pregnancy: prevalences and associated factors.

H.J.van Brummen, H.W. Bruinse, G. van de Pol, A.P.M. Heintz, C.H. van der Vaart  
International Urogynecology Journal of Pelvic Floor Dysfunction 2006  
May;17(3):224-230

Bothersome lower urinary tract symptoms 1 year after first delivery: prevalence and the effect of childbirth.

H.J.van Brummen, H.W. Bruinse, G. van de Pol, A.P.M. Heintz, C.H. van der Vaart  
British Journal of Urology International 2006 Jul;98(1):89-95.

The Pregnancy Mobility Index: a mobility scale during and after pregnancy.

G. van de Pol, J.R.J. de Leeuw, H.J. van Brummen, H.W. Bruinse, A.P.M. Heintz, C.H. van der Vaart  
Acta Obstetricia Gynecologica Scandinavica 2006;85(7):786-91.

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H.J.van Brummen, H.W. Bruinse, G. van de Pol, A.P.M. Heintz, C.H. van der Vaart  
International Urogynecology Journal of Pelvic Floor Dysfunction 2006 Apr 21;  
[Epub ahead of print]

Which factors determine the sexual function one year after childbirth?

H.J.van Brummen, H.W. Bruinse, G. van de Pol, A.P.M. Heintz, C.H. van der Vaart  
International Urogynaecology Journal, 2006, in press

Psychosocial factors and mode of delivery.

G. van de Pol, J.R.J. de Leeuw, H.J. van Brummen, H.W. Bruinse, A.P.M. Heintz,  
C.H. van der Vaart

Journal of Psychosomatic Obstetrics and Gynecology, 2006 in press





