

Effects Of Carrying A Pregnancy and of Method of Delivery on Urinary Incontinence: A
Prospective Cohort Study

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Condensation

This prospective study elucidates the contribution of carrying a pregnancy as well as events during labor and delivery to urinary incontinence in parous women.

Abstract

Effects Of Carrying A Pregnancy and of Method of Delivery on Urinary Incontinence:

A Prospective Evaluation

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Objective: To identify risk factors associated with urinary incontinence in women three months after childbirth.

Methods: Prospective cohort study of urinary incontinence and pregnancy, nested within a randomized controlled trial of prenatal perineal massage. Urinary incontinence was assessed at study enrollment and three months postpartum in 949 pregnant women in Quebec, Canada.

Results: Postpartum urinary incontinence was associated with prepregnancy incontinence (adjusted odds ratio [adjOR] 6.44, 95% CI 4.15, 9.98), incontinence beginning during pregnancy (adjOR 1.93, 95% CI 1.32, 2.83), and increasing prepregnancy body mass index (adjOR 1.07/unit of BMI, 95% CI 1.03,1.11). Caesarean section was highly protective (adjOR 0.27, 95% CI 0.14, 0.50). The weight of the baby, operative vaginal delivery, episiotomy, the length of the second stage of labor, and epidural analgesia did not predict urinary incontinence. Nor did prenatal perineal massage, the trial intervention. Analysis limited to women having a first vaginal birth identified the same risk factors, with similar adjusted odds ratios. When only urinary incontinence occurring at least every week was considered, adjusted odds ratios were also comparable.

Conclusions: Urinary incontinence during pregnancy is extremely common, affecting over half of pregnant women. Urinary incontinence before pregnancy or beginning during pregnancy roughly

doubles the likelihood of urinary incontinence at 3 months postpartum, regardless whether delivery occurs vaginally or by Caesarean section.

Keywords: female; human; delivery; pregnancy, puerperal disorders/epidemiology/etiology; urinary incontinence, stress/epidemiology/etiology, perineal massage.

Background

Bearing children is known to increase the likelihood of developing urinary incontinence, but which aspects of pregnancy and delivery cause urinary incontinence have not been clearly established. In particular, the role of pregnancy itself, independent of labor and delivery practices, in causing incontinence has not been adequately addressed. The risk of urinary stress incontinence is known to increase throughout pregnancy(1). While most women with incontinence during pregnancy will regain continence postpartum, those with postpartum incontinence will almost always have had incontinence during pregnancy(1-3).

The objectives of this study were to identify maternal and obstetrical factors associated with the developing urinary incontinence during pregnancy; to describe the prevalence and severity of postpartum urinary incontinence; and to identify factors associated with incontinence postpartum.

Methods

Information for this study was collected during a randomized controlled trial of perineal massage during the third trimester of pregnancy(4;5). The study population consisted of pregnant women with or without a previous vaginal birth delivering in five secondary and tertiary care hospitals in the province of Quebec, Canada. The study was approved by the ethics committees of each participating institution. Women were enrolled at 30 and 35 weeks gestational age. In the intervention group, women were taught to do a stretching massage of the perineum for 5 to 10 minutes daily from 34-35 weeks gestation until delivery; women in the control group were asked to refrain from perineal massage. There were 1527 women enrolled between September 1994

and December 1995. At enrolment, participants completed a questionnaire on socio-demographics and obstetrical history. Women recruited after March 1995 (n=1198) also completed a self-administered questionnaire on perineal functions during the month before conception and during the month before enrolment (i.e. early third trimester of pregnancy.) The questionnaire elicited information on the frequency (never, less than once per week, 1-6 times a week, once a day, more than once a day) of involuntary loss of urine when coughing, sneezing, laughing, or running. We asked this quantitative question regarding the frequency of stress incontinence since we were interested in the physiologic function - actual episodes of urine loss - rather than the social impact. At three months postpartum, a questionnaire was mailed to each participant asking about stress urinary incontinence at that point in time. Detailed data on the occurrence and severity of perineal lacerations and episiotomy were recorded immediately after the birth by the attending physician or house staff. The perineum was considered to be intact if there was no laceration or a non-sutured first-degree tear. Other information about the labor and delivery was abstracted from the medical record.

For the analysis of predictors of incontinence, incontinence was treated as dichotomous: any vs. no incontinence. Secondary analyses were carried out restricting the outcome to more severe incontinence - at least weekly or at least daily urine loss. To assess urinary incontinence before delivery as a predictor of postpartum incontinence, a categorical variable was constructed with 3 levels: all women with incontinence just before the index pregnancy (95% of these women continued to be incontinent during the pregnancy), incontinence first experienced during this pregnancy, and no incontinence before or during this pregnancy. Maternal, obstetrical and newborn candidate variables for the adjusted models were identified on univariate analysis [OR (univariate odds ratio) <0.8 or >1.25] or proposed in the medical literature. Univariate and

adjusted odds ratios (adjOR) and their 95% confidence intervals (95% CI) were obtained. Odds ratios were used to estimate relative risk through logistic regression analysis; odds ratios somewhat overestimate relative risk when the outcome is common. Since episiotomy and operative delivery are determinants (“in the causal pathway”) of perineal trauma, separate models were used to analyze whether incontinence was better predicted by these interventions or by the degree of perineal trauma. Unadjusted, stratified and logistic regression analyses were carried out using Stata 7.0.

Results

Postpartum questionnaires were returned by 949 (79%) of 1198 women. These women constitute the study population, which has been described in a previous publication(5). Baseline maternal characteristics of responders and non-responders to the postpartum questionnaire were similar in most respects although women who did not return their postpartum questionnaires were slightly younger (mean age, 28.6 vs. 29.8 yr.), less educated (mean educational level, 14.3 vs. 15.8 yr.) and more likely to have given birth by Caesarean section (17.7% vs. 12.0%). There was no difference in the proportion of responders between the perineal massage and control groups. Urinary incontinence before pregnancy, during the third trimester and three months after delivery was experienced by 22.3%, 65.1% and 31.1% of women. Table 1 details the frequency of urinary incontinence before, during and after pregnancy in women delivering by Caesarean section or having a first or subsequent vaginal birth. The 10 women delivered by Caesarean after a previous vaginal birth were excluded from analysis, since there were too few to provide reliable estimates. Although the proportion of primiparous women delivered by Caesarean who

experienced urinary incontinence before (16.3%) and during pregnancy (55.8%) was similar to that of primiparous women who delivered vaginally, 31.2% of women after vaginal births compared to only 11.5% of women delivered by Caesarean were still incontinent postpartum (OR 3.48, 95% CI 1.85, 6.54.) Even when women anticipating a first vaginal birth remained continent during pregnancy (until study enrollment), 20.6% were incontinent after vaginal delivery compared to only 6.6% after Caesarean (OR 3.64, 95% CI 1.07, 12.34). Most (81.8%) of the women with postpartum urinary incontinence were already incontinent before giving birth: 40.3% (119/295) were already incontinent before pregnancy, 40.7% (120/295) developed incontinence by the third trimester, and 18.0% (53/295) between study enrollment and completion of the postpartum questionnaire (third trimester data missing for a few individuals.) Urinary incontinence occurred at least daily in 26/835 (3.11%) of women after vaginal birth and in 1/114 (0.88%) following Caesarean birth (risk difference 2.2%, 95% CI 0.2%, 4.3%). However, compared to those delivering by Caesarean, women delivering vaginally were more likely to have at least daily incontinence before (2.0% vs. 0.9%) and during (10.5% vs. 8.8%) the pregnancy, not just after giving birth (NS).

Urinary incontinence during pregnancy in women continent just before becoming pregnant was more frequent in parous women compared to nulliparous women (OR 1.95, 95% CI 1.42, 2.67). However maternal age, body mass index, weight gain during pregnancy, or factors potentially related to connective tissue properties, such as hair color and stretch marks (data not shown) did not help to predict which women would develop urinary incontinence during pregnancy.

Postpartum urinary incontinence (three months after delivery) was independently associated with incontinence present before becoming pregnant and incontinence beginning during pregnancy (Table 2). This remained true even among women undergoing Caesarean birth. Parous women

were not more likely than nulliparous women to be incontinent postpartum, once pre-pregnancy continence status was taken into account, as demonstrated in the stratified analysis presented in Table 3. Postpartum urinary incontinence was associated strongly with high prepregnancy body mass index (7% for each unit of body mass index). Caesarean section was protective (Table 2). The following factors were not significantly associated with postpartum urinary incontinence in adjusted (multivariate) models: age, weight gain during pregnancy, baby's weight, previous vaginal birth, randomization group (massage or control), type of delivery, epidural anesthesia, duration of second stage of labor, episiotomy (Table 2) or degree of perineal trauma or periurethral tears (data from this model not shown). s When the above analyses were carried out with 'incontinence at least weekly instead of 'any incontinence' as the outcome, the same predictors were significant. Too few subjects had incontinence at least daily (n=27) for stable estimates of odds ratios. Analysis restricted to women having a first vaginal birth yielded the same predictors as analysis of all parities combined.

Overall, only 9.7% (91/943) of women had worse incontinence three months after delivery than in the third trimester. Worse incontinence occurred in only 3.5% (4/114) of women who had Caesarean section (adjOR 0.28, 95% CI 0.09,0.85) compared with 10.5% (87/829) who had vaginal delivery. Worsening tended to be more likely after forceps deliveries (adjOR 1.83, 95% CI 0.99,3.37) than after vacuum extraction (adjOR 1.33, 95% CI 0.73,2.42). Maternal body mass index (adjOR 1.06 per unit of BMI, 95% CI 1.01, 1.11) was significantly associated with worse incontinence. Maternal age, baby's weight, length of the second stage, episiotomy, periurethral lacerations and degree of perineal trauma did not predict significant peripartum worsening of urinary incontinence.

Comment

The 79% response rate to the postpartum questionnaire is very satisfactory for a single mailing. Although women experiencing urinary incontinence before or during the pregnancy were slightly more likely to respond, the availability of information on their antepartum continence status allows us to control for this difference in the analysis, and minimizes the possibility of bias. Women experiencing postpartum urinary incontinence may have been more or less likely to respond to the questionnaire; but the direction of this potential bias is unclear. We used a quantitative question regarding the frequency of stress incontinence, since we were interested in actual episodes of urine loss. The question has been validated as part of the King's Health Questionnaire as a separately scored item(6). While some questionnaires (e.g. Urogenital Distress Inventory) emphasize the social and hygienic impact of incontinence, actual urine loss, rather than women's adaptation to it is more pertinent to an exploration of causal factors. We did not address urge incontinence; Wilson(2) found no difference in predictors of different types of incontinence (any, stress or 'pure stress') at three months postpartum; they also found no relation between obstetrical factors and urinary frequency and nocturia.

This prospective study of 949 women highlights the magnitude of the problem of urinary incontinence during pregnancy. Although parous women are more likely to suffer from incontinence, a surprising proportion of women with no previous delivery by any route (15.4%) reported that they had been incontinent before becoming pregnant. By the third trimester, over half of pregnant women anticipating a first vaginal birth and fully three quarters of women with a previous vaginal birth reported incontinence. Since this information was collected at 30-34 weeks gestation, still more women may have become incontinent during the remaining weeks

before delivery. In fact, serial interviews of pregnant women suggest that this is likely(7). The figures are strikingly high, but of the same order as reported by Francis(3), who found that 22% of primigravid women had occasional stress incontinence before and 53% percent during a first pregnancy. We found that just under a third of women after a first vaginal delivery and more than a third after a subsequent vaginal birth continue to have urinary incontinence three months later. The fact that the proportion of women in our population remaining incontinent 3 months after a first vaginal delivery (31.2%) is virtually identical to the proportion of women with a previous vaginal delivery reporting incontinence just before the index pregnancy (31.9%) suggests that the problem usually does not resolve over time. Only 2.8% of women after first vaginal births and 3.5% after subsequent births had severe (at least daily) urinary incontinence, but the risk of leakage of urine even with lesser degrees of incontinence may constrict women's daily life and activities.

Incontinence during pregnancy often resolves postpartum(3;7-9). However, incontinence beginning during pregnancy is neither trivial – 13.6% of these women endured incontinence every day - nor transient: it indicates a significant risk of persistent urinary incontinence, even in women eventually delivered by Caesarean section. In fact, this prospective data confirms retrospective studies(8;10) in finding that pregnancy-induced incontinence is one of the strongest predictors of postpartum incontinence regardless of the route of delivery. In fact, stress incontinence rarely appears for the first time after childbirth if it has not happened during the pregnancy(3;7). Thus determining who is at risk of becoming incontinent during pregnancy would be helpful in targeting preventive interventions. Unfortunately, we were not able to identify predictive maternal characteristics, although increasing maternal age and body mass index augmented the risk of postpartum incontinence. Consequently, measures such as pelvic

floor exercises in pregnancy which prevent postpartum urinary incontinence(11) are best recommended to all pregnant women.

Incontinence was worse after delivery in up to 10% of women. This estimate is an upper limit for the proportion of women whose incontinence was a result of the delivery, since some may have become incontinent between enrollment in the study and delivery. It is in the same range as found by others(2;8;9;12). Caesarean delivery was protective against postpartum urinary incontinence: more than twice as many women are incontinent after a vaginal birth than after Caesarean delivery. This observation is consistent throughout the literature. Impairment of continence during pregnancy seems to be largely reversible unless the stresses of vaginal birth are superimposed: of the 12 women with Caesarean delivery and postpartum urinary incontinence, 8 were already incontinent by the early third trimester. Episiotomy was introduced in part to protect the pelvic floor and prevent urinary incontinence(13). But our and others' work (14) (9;15;16) do not show a significant association between episiotomy and urinary incontinence. Avoiding episiotomy increases periurethral tears(17) but we found that periurethral tears do not increase the risk of urinary incontinence. The relative risk for postpartum urinary incontinence after forceps delivery was consistent with a modest increase but the confidence limits included no increase in risk. Studies by Wilson (2) and Farrell(18) also found no increased risk with forceps deliveries. Vacuum extraction did not significantly increase risk. Despite concerns expressed by some obstetricians regarding perineal massage, this randomized controlled trial reassured us that the perineal stretching induced by massage does not impair or substantially protect against urinary continence (5). Pelvic floor damage has been attributed to intrapartum events by Allen(19), who described neurophysiologic changes in association with a long second stage and larger babies. However, we and others (2;8;18) found that birthweight and the length of the

second stage did not contribute to postpartum urinary incontinence. As shown in Table 2, even in women having a first vaginal birth, there was no trend towards incontinence with increasing length of the second stage or macrosomia. This was true both in univariate analysis and after adjustment for potentially confounding factors such as operative vaginal delivery or degree of perineal trauma. We unfortunately cannot comment on the duration of active pushing in the second stage, since we did not collect this information.

Conclusion

Being pregnant causes urinary incontinence in the majority of women. Carrying a pregnancy increases the risk of urinary incontinence whether delivery is vaginal or by Caesarean. However, Caesarean delivery is associated with a lower absolute risk of postpartum urinary incontinence. Further research into the prevention of pregnancy-associated incontinence is needed.

Competing interests none declared

Authors Contributions

EE and ML conceived of and designed the study, designed the draft questionnaires, coordinated the study and drafted the manuscript. MM and SL helped to design the study, performed the statistical analyses and participated in drafting the manuscript. All authors read and approved the final manuscript.

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Table 1. Urinary stress incontinence before, during and 3 months after pregnancy in 835 women delivering vaginally without or with a previous vaginal birth, and in 104 primiparous women delivering by Caesarean.

	Urinary stress incontinence*					
	before pregnancy		third trimester		3 mo. postpartum	
	N	%	N	%	N	%
1st vaginal birth (N=467)						
None	392	83.9	190	41.1	322	68.8
Less than once per week	62	13.3	168	36.4	99	21.2
One to six times per week	6	1.3	72	15.6	34	7.3
Once daily	4	0.9	17	3.7	8	1.7
More than once daily	3	0.6	15	3.3	5	1.1
Repeat vaginal birth (N=367)						
None	250	68.1	89	24.3	232	63.2
Less than once per week	93	25.3	145	39.5	98	26.7
One to six times per week	14	3.8	78	21.3	24	6.5
Once daily	6	1.6	28	7.6	2	0.5
More than once daily	4	1.1	27	7.4	11	3.0
1st Caesarean section (N=104)						
None	87	83.7	46	44.2	92	88.5
Less than once per week	15	14.4	34	32.7	10	9.6
One to six times per week	2	1.9	17	16.4	1	1.0
Once daily	0	0	5	4.8	1	1.0
More than once daily	0	0	2	1.9	0	0

*Totals may vary due to missing values. Ten women with a previous vaginal birth who delivered by Caesarean are excluded.

Table 2. Risk factors for any urinary incontinence three months postpartum

Risk factors	N	Risk (%)	Crude OR	95% CI	Adj. OR*	95% CI
Age (years)						
≤ 25	141	26	1.00	-		
26-29	338	29	1.16	0.75,1.81		
30-34	356	32	1.29	0.83, 2.00		
≥ 35	114	41	1.97	1.16,3.35		
Age (continuous)			1.04	1.01,1.07	1.02	0.99,1.06
Body mass index (BMI) (kg/m²)						
< 20.0	216	25	1.00	-		
20.0-23.9	442	30	1.31	0.90,1.89		
≥ 24.0	291	37	1.74	1.18,2.58		
BMI (continuous)			1.05	1.02,1.09	1.07	1.03,1.11
Weight gain during pregnancy (kg)						
≤ 11.0	268	31	1.00	-		
11.1-14.0	272	30	0.93	0.64,1.34		
14.1-17.0	194	35	1.18	0.80,1.75		
> 17.0	215	29	0.89	0.60,1.31		
Baby's weight (g)						
< 4000	837	31	1.00	-		
≥ 4000	112	30	0.96	0.73,1.48		
Previous vaginal birth						
0	572	28	1.00	-	1.00	-
≥ 1	377	36	1.50	1.13,1.98	1.30	0.85,1.98
Group of randomization						
Controls	478	33	1.00			
Massage	470	29	0.85	0.65,1.12		
Urinary incontinence						
Before delivery						
None	319	17	1.00	-	1.00	-
Onset before Index pregnancy	211	56	6.24	4.20,9.27	6.44	4.15,9.98
Onset during Index pregnancy	412	29	1.98	1.39,2.83	1.93	1.32,2.83
Type of delivery						
Spontaneous	682	33	1.00	-	1.00	-
Vacuum	79	35	1.11	0.68,1.80	1.27	0.74,2.19
Forceps	74	37	1.16	0.70,1.91	1.73	0.96,3.13
Caesarean ^{††}	114	12	0.28	0.16,0.51	0.27	0.14,0.50
Epidural anesthesia [‡]						

No	294	35	1.00	-		
Yes	541	33	0.93	0.69,1.26		
Duration of second Stage (hrs)‡						
< 0.5	317	39	1.00	-	1.00	-
0.5-0.9	175	31	0.71	0.48,1.06	0.85	0.54,1.33
1.0-1.4	127	31	0.71	0.46,1.10	0.78	0.46,1.35
≥ 1.5	216	31	0.71	0.49,1.0	0.68	0.52,1.42
Episiotomy‡						
No	612	35	1.00	-	1.00	-
Yes	223	29	0.75	0.54,1.05	0.68	0.47,1.01

Total may vary because of missing values.

*Adjusted for maternal age, body mass index, previous vaginal birth, timing of onset of urinary incontinence, type of delivery, duration of second stage, and episiotomy.

‡only vaginal deliveries (n=835) included

‡‡Adjusted for maternal age, body mass index, previous vaginal birth, timing of onset of urinary incontinence, type of delivery

Table 3: Proportion of women with urinary incontinence 3 months postpartum

	Previous vaginal birth		P value
	None	One or more	
Continent prepregnancy	22.8%	25.6%	0.39*
incontinent prepregnancy	52.2%	59.7%	0.27*

* Chi-square test