Chapter 4

The effect of childbirth on anal incontinence: a population based, cross-sectional cohort study.

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Introduction

Childbirth has been suggested as an important risk factor for faecal incontinence in women.[1,2] This has been based on the observation that childbirth causes subclinical mechanical damage of the anal sphincter complex and its innervation in approximately one out of three primiparous women.[3,4] However, the association between childbirth and faecal incontinence has not been reported. If childbirth is an important risk factor for faecal incontinence one might expect to find differences in prevalence between parous and nulliparous women. We therefore undertook a population-based, cross-sectional cohort study to examine the effect of parity on flatus and faecal incontinence.

Methods

Study population

A random sample of 3200 women, aged 20-70 years, was obtained from the population registration office of a suburban area in the Netherlands. This sample represents 15% of women in this age group in the selected area. All women were invited to participate in a study on bowel and micturition symptoms. In the accompanying letter care was also taken to encourage women without symptoms to participate. All obtained data were anonymous. A total of 2259 questionnaires (70.6%) were returned. Ninety-one questionnaires were returned because of unknown address and 126 women refused to participate, leaving 2042 (63.8%) fully evaluable women. The study was approved by the local ethics committee.

Measurements

All women received a postal questionnaire in 1999.

Anal incontinence symptoms were measured as follows. Women who replied positively to the question " do you ever experience involuntary loss of intestinal gas" were considered to have flatus incontinence. Women who replied positively to the questions "do you ever experience involuntary loss of liquid stool" and/or " do you ever

experience involuntary loss of solid stool" were considered to have faecal incontinence. No attempt was made to assess the frequency of loss since we considered any involuntary loss of flatus or faeces to be abnormal.

Besides information on parity, data on possible confounding factors like age, previous hysterectomy, physical functioning and educational level were collected. Physical functioning was measured with the RAND-36.[5] The RAND-36 is a generic quality of life questionnaire that consists of 36 items about functioning on 8 domains: general health, physical functioning, mental health, social functioning, vitality, bodily pain, role limitation because of physical functioning and role-limitation because of emotional functioning. The total score on each domain ranges between 0 (worst) and 100 (best) quality of life. The domain physical functioning was used in our analysis. Data on educational level were dichotomized into primary school only or secondary or higher.

Finally, questions about constipation and urinary incontinence were asked. Since the pathophysiology of faecal incontinence (mechanical and innervation damage of the pelvic floor) is, at least partly, the same as that of urinary incontinence and constipation, the latter two were considered to possibly modify the effect of parity on faecal incontinence. According to international recommendations [6] a woman was considered to have functional constipation if she replied positively to both of the following questions namely: "do you have your bowel movement less than three times a week" and " do you have to strain in more than 25% of time in order to pass your stools". Those women with functional constipation that also answered positively to one of the following questions "do you ever have to remove your feces digitally from your rectum" or "do you have to puss on your vaginal wall in order to have your bowel movement" or "do you experience a sensation of anal blockage when you have your bowel movement" were considered to have outlet constipation.[7,8] Following the recommended ICS definition of different types of urinary incontinence [9] and in concordance with other studies, [10] a woman was considered to have stress-related urinary incontinence if she replied positively to the question "do you experience urine leakage related to physical activity,

coughing or sneezing?"(hereafter referred to as stress incontinence).
A woman was considered to have urgency-related urinary incontinence if she replied positively to the question "do you experience urine leakage related to the feeling of urgency?"(hereafter referred to as urge incontinence).

Statistical analysis

Qualitative parameters are expressed as numbers and percentages and interval parameters are expressed as means with standard deviation (SD). Distributions of qualitative parameters between groups were compared by the Fisher exact test. Students t-test statistics was used to compare interval data between groups. Univariate logistic regression analysis was used to calculate crude odds ratio's (OR) with 95% confidence interval (CI). Multivariate logistic regression was used to obtain adjusted OR with 95% CI for anal incontinence for possible associated factors. In multivariate logistic regression analysis the goodness-of-fit of the model was assessed with the Hosmer-Lemeshow test. Two models were tested. One model explored the effect of possible confounders, the second model also included modification effects. All statistics were performed with the statistical package SPSS 10.0.

Results

Table 1 shows the characteristics of the study population.

Differences between parous and nulliparous women regarding mean age, physical functioning, educational level, anal incontinence, urinary incontinence, constipation and history of hysterectomy are presented in Table 2. Parous women were significantly older, less educated, had a history of hysterectomy, reported urinary stress and urge symptoms and had a lower mean physical functioning score as compared to nulliparous women. No differences were found between groups regarding anal incontinence and constipation.

Table 1 Characteristics of the study population.

Age (years)	46.5 (13.1)
Age distribution	
20-29 years	233 (11.4)
30-39 years	443 (21.6)
40-49 years	465 (22.7)
50-59 years	501 (24.5)
60-70 years	400 (19.8)
Parity	
0	581 (28.5)
1	241 (15.6)
2	708 (27.9)
≥3	512 (14.8)
Mode of delivery	
Spontaneous vaginal only	1144 (78.4)
Cesarean section at least ones	131 (9.0)
Vacuum delivery at least ones	156 (10.7)
Forceps delivery at least ones	83 (5.7)
Perineal trauma	
Episiotomy at least ones	1170 (57.2)
Perineal rupture (any type) at least ones	947 (46.4)
Educational level	
Primary only (low level)	439 (21.5)
Secondary or higher (high level)	1603 (78.5)
Marital status	
Married	1359 (66.6)
Divorced	145 (7.1)
Widow	98 (4.8)
Never been married	440 (21.5)
History of hysterectomy	212 (10.3)

Values are given as mean (SD) or n (%)

Table 2 Comparison of different factors between parous and nulliparous women.

	Nulliparous (n=581)	Parous (n=1461)	Significance level †
Age in years *	38.9 (0.6)	49.4 (0.3)	<0.001
RAND-36			
Physical functioning *	88.3(0.7)	85.7 (0.5)	0.002
Role limitation physical *	77.7 (1.5)	78.8 (0.9)	NS
Anal incontinence ‡			
Flatus incontinence	205 (35.3)	501 (34.3)	NS
Faecal incontinence	44 (7.6)	90 (6.2)	NS
Urinary incontinence ‡			
Stress	159 (27.6)	770 (53.3)	<0.001
Urge	79 (13.7)	372 (25.8)	<0.001
Constipation ‡			
Functional	39 (6.7)	85 (5.8)	NS
Outlet	50 (8.6)	127 (8.7)	NS
Educational level ‡			
Primary only	71 (12.3)	364 (25.1)	<0.001
Secondary or higher	505 (87.7)	1084 (74.9)	
History of hysterectomy ‡	25 (4.3)	184 (12.6)	<0.001

*=Mean (SEM). ‡= numbers(%).

† Fisher exact test for nominal data, Student's t-test for interval variables. Expressed as p-values, NS=Not Significant

Table 3 shows the crude odds ratio's for the three types of anal incontinence for potential associated factors. The odds for faecal incontinence was significantly increased for women with urinary stress or urge symptoms, women older than 60 years, women with outlet constipation, women who had a hysterectomy and lower educated women. The odds for flatus incontinence was significantly increased for women older than 50 years, women with outlet constipation and women with urinary stress or urge symptoms.

Table 3 Crude odds ratio's (95% confidence interval) of types of anal incontinence for potential associated factors.

	Faecal incontinence	**Flatus incontinence**
Parity		
Nulliparous	1.0	1.0
Parous	0.8 (0.6-1.2)	0.9 (0.8-1.2)
Age in 10-years interval		
20-29 (reference)	1.0	1.0
30-39	0.7 (0.4-1.5)	1.0 (0.7-1.4)
40-49	1.1 (0.6-2.1)	1.0 (0.7-1.5)
50-59	1.0 (0.5-1.9)	1.5 (1.1-2.1)*
60-70	1.9 (1.1-3.5)*	1.7 (1.2-2.4)*
Constipation		
No	1.0	1.0
Functional	1.1 (0.5-3.2)	1.2 (0.8-1.7)
Outlet	1.9 (1.1-3.2)*	2.2 (1.6-3.0)*
Urinary incontinence		
Stress-related	2.4 (1.7-3.5)*	1.9 (1.6-2.3)*
Urge-related	2.9 (2.0-4.2)*	2.1 (1.7-2.6)*
Hysterectomy	1.6 (1.0-2.7)*	1.1 (0.8-1.5)
Educational level		
Primary only	1.0	1.0
Secondary or higher	0.6 (0.4-0.9)*	0.9 (0.7-1.1)

* $p<0.05$

All potential confounding factors (significantly associated with both parity and anal incontinence, but not related to the occurrence relation) were entered into a multivariate logistic regression model.

Table 4 shows the crude and adjusted OR with 95%CI for anal incontinence for parity. The effect of childbirth was corrected for age, physical functioning, history of hysterectomy and educational level. Parous women had a statistical significant 37% reduction in odds for faecal incontinence as compared to nulliparous women.

Parous women also had a 17% reduction in odds for flatus incontinence but this did not reach statistical significancy (p=0.09).

Table 4 Adjusted odds ratio's (95% confidence interval) of types of anal incontinence for parity and potential confounders.

Parity	**Flatus incontinence**	**Faecal incontinence**
Parity (parous versus nulliparous), crude	0.94 (0.78-1.17)	0.80 (0.55-1.17)
Adjusted for age	0.80 (0.64-0.99)*	0.65 (0.44-0.96)*
Adjusted for age and hysterectomy	0.80 (0.64-0.99)*	0.64 (0.43-0.95)*
Adjusted for age, hysterectomy and educational level	0.81 (0.65-1.00)	0.61 (0.41-0.92)*
Adjusted for age, hysterectomy, educational level and physical functioning	0.83 (0.66-1.03)	0.63 (0.42-0.95)*

* $p<0.05$

Finally, the modifying effect of urinary incontinence on the occurrence relation parity - faecal incontinence was assessed. The adjusted odds for faecal incontinence was 0.46 (95%CI 0.28-0.76) for parous women with urinary incontinence as compared to nulliparous women with urinary incontinence. The adjusted odds for faecal incontinence was 0.63 (95%CI 0.30-1.34) for parous women without urinary incontinence as compared to nulliparous women without urinary incontinence.

Discussion

Our data do not support the wide-spread view that childbirth is a risk factor for flatus or faecal incontinence in women. In fact, we found that childbirth reduces the risk of faecal incontinence significantly. This protective effect is most prominent among women who also report urinary incontinence symptoms.

The strength of our study is that we compared the prevalence of anal incontinence between parous and nulliparous women in a population based cohort, and that we adjusted the effect for potential confounders. Our study also has some potential limitations that need to be addressed.

First, because of the design of the study, we were not able to make a definitive diagnosis of anal or urinary incontinence. However, there are no valid tests to confirm faecal incontinence accept for seeing actual loss, which will be seldom feasible even in a clinical settings. One has to rely mainly on self-reported symptoms. For urinary incontinence there are diagnostic tests, like urodynamic testing, available to try to confirm the diagnosis of urinary incontinence. However, urodynamic results often correlate poorly with symptoms, especially urge incontinence.[11,12] Since we adjusted the effect of parity on faecal incontinence for both types of urine loss, and found no major differences, a definitive diagnosis of the type of urinary incontinence would not have altered our results. Secondly, we were not informed about the severity of faecal incontinence. If parous women, although having a reduced prevalence of overall faecal incontinence, had more severe faecal incontinence this could have it's implications for clinical practice. However, we also found reduced odds of flatus incontinence for parous women. Flatus incontinence can be regarded as a symptom of less severe damage of the continence mechanism.

Why is childbirth so commonly stated to be a major risk factor for faecal incontinence? If true, such a statement should be supported by epidemiological data as well as supportive data on a well-defined pathophysiological pathway.

Epidemiological studies on the prevalence of faecal incontinence in the general population are scarce.[13-15] Two large community-based studies on the prevalence of anal incontinence are widely quoted. Nelson and co-workers, examining a population sample ≥18 years old, found that the age-adjusted odds for women to have anal incontinence was 1.5 times that of men.[14] However, the definition of anal incontinence included involuntary loss of gas and data were collected from "the most knowledgeable member

of the household" on the continence status of the other members of the household. The latter might not have been an appropriate way to identify an embarrassing condition like faecal incontinence. Drossman and co-workers studied a random sample of men and women aged 15 years or older. They did not demonstrate any difference in prevalence between men and women.[15] Faecal incontinence (defined as involuntary loss of faecal material) was reported by 7.7% of females and 7.9% of males. The prevalence increased with ageing. Our reported prevalence of faecal incontinence is the same as in this study. Unfortunately, both the Nelson and Drossman studies did not control their data on women for parity. That faecal incontinence is not limited to women is further supported by the observation that in the elderly, male gender is an independent risk factor for faecal incontinence.[16,17] The only epidemiological data on the relationship between parity and faecal incontinence comes from studies that report on the new development of faecal incontinence after delivery.[3,4,18-21] However, these studies 1) often assess the presence of faecal incontinence symptoms in the first nine months after delivery, 2) usually find that observed anal sphincter damage does not produce symptoms in the majority of women, 3) are performed on selected samples, and 4) do not adjust their data for potential confounders. The long-term relationship between childbirth and anal incontinence was studied by Ryhammer and co-workers.[22] They identified that multiple vaginal deliveries increase the risk of permanent incontinence of flatus and urinary incontinence, but not for faecal incontinence. This study also did not address the issue of confounding and data were not compared to nulliparous women.

The major body of evidence that childbirth is the major risk factor of faecal incontinence seems to be derived from the observation that childbirth can cause mechanical and innervation damage of the anal sphincter complex.[3,4,23-25] Major anal sphincter lacerations (third and fourth degree) will induce faecal incontinence directly and not all women will achieve continence after repair of these defects.[26-28] However, these third and fourth degree lacerations occur in approximately 1% of deliveries in countries were posterolateral episiotomies are preferred over median episiotomies.[28,29]

The long-term consequences of major anal sphincter lacerations are unclear. At 30-year follow-up, the prevalence of faecal incontinence was equal among women who had a third or fourth degree anal sphincter laceration and women who had delivered by a cesarean section.[30] This suggests that other factors play an important role in the development of faecal incontinence.

With the introduction of anal endosonography it became clear that approximately one-third of primipara will have subclinical damage of the anal sphincter complex.[3,4] However, only a minority of women with subclinical anal sphincter damage will have anal incontinence symptoms, predominantly flatus incontinence.[3] It was postulated that further damage in consecutive pregnancies may expose women with subclinical anal sphincter damage to a higher risk of faecal incontinence later in life. This was supported by the results of a recent study in which it was demonstrated that anal sphincter damage occurred in 34% of primipara, of whom 42% developed faecal incontinence after a second delivery.[4] This would implicate that approximately 15% of multipara would have faecal incontinence. Because the presence of faecal incontinence symptoms was assessed within 6 to 12 weeks after delivery the results may have been seriously biased. Two-third of women who had an abnormal prolonged pudendal nerve terminal motor latency (PNTML), as indicator of innervation damage to the anal sphincter, at six weeks after delivery fully recovered at six months.[25] Therefore women who have symptoms early after delivery may not have symptoms in longer follow-up. As with major lacerations, the long term consequences of subclinical anal sphincter damage are questionable. Perimenopausal parous women were shown to have the same anal canal maximum resting and squeezing pressure as nulliparous women.[31] A finding one would not have expected knowing that at least one out of three parous women had suffered subclinical anal sphincter damage.

Anal continence is the result of a complex interaction between anal sphincter function, rectal sensitivity and adaptation, stool structure, cognitive and physical functioning.[32-36] It is therefore obvious that studying the consequences of childbirth in

such a complex system, other potential risk factors for faecal incontinence have to be accounted for. Since we cannot reliably assume that the distribution of these factors will be equal among parous and nulliparous women, careful assessment of possible confounders is obligatory when studying risk factors for faecal incontinence.
The exact contribution of all these factors to the continence mechanism is still poorly understood and therefore our finding that childbirth has a protective effect on the development of faecal incontinence has to be interpreted with caution. A hypothetical explanation for this finding is that parous women are better able to adjust their rectum to distension. Poor adjustment has been shown to occur in faecal incontinent patients with normal anal canal pressures.[33] The observation that rectoceles are more common in parous as compared to nulliparous women may explain this better adjustment to distension. Data to support this hypothesis are not available.

In conclusion, the need to identify risk factors for third or fourth degree anal sphincter lacerations remains obvious. However, whether childbirth-related subclinical anal sphincter damage has a long-term effect on the anal continence mechanism is highly questionable. The results of our study indicate that there are probably more important factors than childbirth involved in the pathophysiology of faecal incontinence in women. Our findings do not support recommendations to change obstetrical practice in women with subclinical anal sphincter lesion in their consecutive pregnancies.

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