Urinary incontinence during pregnancy

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Key words: cohort study, epidemiology, incidence, pregnancy, prevalence, urinary incontinence

A Norwegian observational study of urinary incontinence during pregnancy

Prêcis:

The prevalence of urinary incontinence more than doubles during pregnancy compared with the prepregnancy state.

Abstract

Objectives:

To investigate incidence and prevalence of urinary incontinence during pregnancy, and associated risk factors.

Method:

The data collection was conducted as part of the Norwegian Mother and Child Cohort Study at the Norwegian Institute of Public Health. We present questionnaire data about urinary incontinence obtained from 43,279 women (response rate 45%) by week 30. We report data on any incontinence in addition to type, frequency and amount of incontinence. Potential risk factors were investigated by logistic regression analyses.

Results:

The prevalence of incontinence increased from 26% before pregnancy to 58% in week 30. The corresponding figures for nulliparous women were 15% and 48%, and for parous women 35% and 67%. The cumulative incidence was 46%. Stress urinary incontinence was the most common type of incontinence in week 30 of pregnancy, experienced by 31% of nulliparous and 42% of parous women. The majority of pregnant women had leakage less than once a week and droplets only, both before and during pregnancy. Parity was a strong and significant risk factor for incontinence in adjusted analyses both before pregnancy (OR 2.5 (2.4-2.7) for primiparous and OR 3.3 (3.1-3.5) for multiparous women) and during pregnancy (ORs 2.0 (1.9-2.1) and 2.1 (2.0-2.2), respectively). Age and body mass index were weaker, but still statistically significant, risk factors.

Conclusions:

The prevalence of urinary incontinence increases substantially during pregnancy. Incontinence both before and during pregnancy seems to be associated with parity, age and body mass index.

A Norwegian observational study of urinary incontinence during pregnancy

Introduction

Urinary incontinence is a common condition among women.[1-4] The prevalence of urinary incontinence has previously been documented to be high both during and after pregnancy,[5-7] and childbearing is an established risk factor for urinary incontinence among young and middle-aged women.[4, 8, 9] However, incidence and prevalence estimates of incontinence vary widely. [10] Only a few population based studies have investigated prevalence of urinary incontinence during pregnancy by type and severity.[6] Also, data are scarce on risk factors for incontinence in pregnancy.

The Norwegian Mother and Child Cohort Study (MoBa) is a large population-based study starting in pregnancy with several years of follow-up, aiming at investigating health issues among both mothers and children.[11] The objective of the present substudy was to estimate the prevalence and cumulative incidence of any incontinence as well as different types of incontinence and severity indicators. We also investigated how common risk factors for urinary incontinence in the non-pregnant state, such as age, body mass index and parity, were interacting with urinary incontinence during pregnancy.

Materials and Methods

The data collection was conducted as part of the Norwegian Mother and Child Cohort Study at the Norwegian Institute of Public Health.[11] The aim of that study was to investigate specific etiological hypotheses by investigating the associations between exposures and diseases. In the case of urinary incontinence, data about the natural course was obtained during and after the pregnancy.

There are approximately 55,000 births annually in Norway. The target population for MoBa, starting in 1999, consisted of all pregnant women in Norway who could read and write Norwegian, aiming at a sample size of 100,000 women. All hospitals and maternity units with more than 100 births annually, altogether 52 units participate in the study. MoBa invited all pregnant women in Norway to participate in the study two weeks before the routine pregnancy ultrasound examination, which usually takes place in week 17. The pregnant women received a postal invitation containing an information folder, Questionnaire 1 and 2, a questionnaire for the child's father and an informed consent form as they were summoned for routine ultrasound examination. The study was comprehensive, obtaining data by questionnaires of 14-18 pages length at six time points from week 15 in pregnancy to seven years after birth.

Questionnaire 1 focused on different exposures as well as health history before and during pregnancy (e.g. menstrual periods, diseases, mental health and afflictions), medication, occupation, lifestyle habits and marital status. Questionnaire 2 focused on diet. The women were informed of the voluntary nature of the project and the possibility

to withdraw from the study at any time. The women sent the completed questionnaires and consent form to The Medical Birth Registry of Norway (MBRN). In week 30 of pregnancy the participants received Questionnaire 3, which focused on health outcomes during pregnancy in addition to follow up questions from Questionnaire 1. MoBa mailed subsequent questionnaires on maternal and child health status to the mother when the child was 6 months, 18 months, 3 years and 7 years old. Health outcomes were also collected from hospital discharge registries as well as other health registries such as MBRN.

By 2006, 45% of the approached women have accepted to participate.[11] To increase participation, MoBa informed through media. MoBa also set up yearly seminars at the Hospitals to train and motivate the involved health professionals. To improve the attending number of participating women, health professionals and midwifes reminded the women about MoBa study when they attended ultrasound. If the woman decided not to take part in the MoBa study, she was not persuaded. If she had not made up her mind or had not received the invitation letter, the midwife informed about the study. Thus the women were shown the heavy workload of filling in the questionnaire, and there was no high pressure to obtain participation. However, given participation the willingness of follow up was strongly emphasized.

In the present substudy, only women who contributed with one single pregnancy in MoBa were included. Women who participated with more than one pregnancy were

excluded (n=2983). Hence, the present substudy was based on data from 43,279 women who filled in Questionnaire 1 and 3 during pregnancy.

MoBa asked the women about current leakage and leakage before pregnancy. They were asked to report their leakage as occurring when "coughing/laughing/ sneezing", when "running/jumping" and/or if they had "leakage accompanied by a strong urge to void". Answer alternatives were "yes" or "no". Questions regarding urinary incontinence before and during pregnancy were answered by 96.9% and 97.0%, respectively. We defined the incontinent group in this material by including everyone answering "yes" on the entry questions regarding urinary incontinence before or during pregnancy (n=10,520 and n=24,229, respectively). Those who, despite answering "no" but still answered confirmatively about frequency *and* amount before or during pregnancy, were defined as incontinent (n = 493 and n = 24, respectively). Additionally, those who failed to answer the entry question, but still answered confirmatively regarding frequency *or* volume before or during pregnancy were also defined as incontinent (n = 281 and n = 84, respectively).

Women confirming loss of urine in association with coughing, laughing, sneezing, running or jumping before or during pregnancy were defined as having a stress component of urinary incontinence. Women with urgency accompanying loss of urine were defined as having a component of urge urinary incontinence. We use the term 'stress urinary incontinence' (SUI) for women who had a stress component only, while 'urge urinary incontinence' (UUI) denotes women who had an urge component only.

Women who had symptoms of both components are referred to as having mixed urinary incontinence (MUI), according to standardized terminology of lower urinary tract symptoms. [12]

Incontinent women were asked about frequency and volume of leakage. Frequency had four answer categories: “1-4 times pr month”, “1-6 times pr week”, “Once a day” or “More than once a day”. We merged the two last frequency groups into “Once or more a day” in the analyses. There were two categories for amount of leakage: “Droplets” or “Larger amounts”. Among the women reporting incontinence before pregnancy, the response rates on frequency and amount were 95% and 91%, respectively. The corresponding response rates for women reporting incontinence during pregnancy were 94% and 83%, respectively.

We defined cumulative incidence of incontinence as stress, urge, mixed, or any incontinence developed during pregnancy among women who were continent before pregnancy. Prevalence was based on the number of women with urinary incontinence divided by the total number of women participating in this substudy. The sum of cumulative incidence will hence not be the same as the increase in prevalence.

Age was self reported. Based on the prevalence curve, we categorized age into four age groups (≤ 26, 27-30, 31-34, ≥ 35 years). The height was reported at week 17. We excluded outliers; leaving values 140 – 196 cm. Body mass index (BMI) was calculated as weight in kilograms/(height in meters)^2. For BMI before pregnancy, we used the

weight reported by the women at the start of the pregnancy. For BMI during pregnancy, we used the weight reported at week 30. Outliers for weight were excluded; leaving values 40 – 180 kg. Data on parity was obtained from MBRN.

The Norwegian Data Inspectorate approved the project in 1996 and renewed in 2003. The MoBa project has also been approved by the Regional Ethics Committees for Medical Research, Health Region II.

We used Chi-squared tests when comparing different types of urinary incontinence with regard to severity and frequency. Confounding was evaluated and adjusted for by multiple logistic regression analyses. We treated independent variables as categorical. Data are presented as mean proportions or odds ratio (OR) with 95% confidence intervals (CI). We accepted statistical significance at the 5% level ($P<0.05$). We used the statistical software package SPSS 13.0 for Windows (SPSS Inc., Chicago, IL) for all data analyses.

Results

The mean age at the time of filling in Questionnaire 3 was 29.5 years (range 14-47). The mean number of deliveries before the present pregnancy was 0.8 (range 0-10). The mean pre-pregnancy BMI was 24.1 kg/m^2 (range 13 – 59). Other demographic information has been described in detail elsewhere.[11]

Urinary incontinence before pregnancy

Urinary incontinence was reported by 11,294 (26.2%) women before pregnancy (Table 1). SUI was most common, and experienced by 7,269 (16.9%) women. Stress and mixed incontinence were three times more common among parous women as compared with nulliparous women (Table 1). Both frequency and amount of urinary leakage varied with the provocative situation. Weekly leakage or more was reported by 2,064 (4.7%) women in association with coughing/laughing, by 1,107 (2.5%) in association with running/jumping, and by 759 (1.8%) who had symptoms associated with urgency. The corresponding figures for women leaking "larger amounts" were 505 (1.2%), 498 (1.2%) and 396 (0.9%) (Table 2).

The prevalence of incontinence increased with age (Table 3). As many as 3,083 (15.4%) nulliparous women reported incontinence before pregnancy. However, the prevalence was significantly higher among parous women as 4662 (33%) primiparous women and 3549 (40%) multiparous women reported incontinence. The prevalence also increased with increasing BMI (Table 3). Adjusted analyses showed an attenuated association between age and incontinence as compared to unadjusted analyses, while corresponding results for BMI and parity essentially remained the same (Table 3).

Urinary incontinence during pregnancy

Urinary incontinence was reported by 25,121 (58.1%) women during pregnancy (Table 1). SUI was the most common type, reported by 6,171 (30.9%) nulliparous and 9,790 (42.0%) parous women. Among women who were continent before pregnancy, the cumulative incidence of any incontinence was 45.6% (13,978/30,631) by week 30 of

pregnancy. The cumulative incidence was 31.5% (9,634/30,631), 4.0% (1,231/30,631) and 10.2% (3,113/30,631) for stress, urge and mixed incontinence, respectively.

Weekly leakage or more was reported by 9,373 (21.7%) in association with coughing/laughing, by 2,839 (6.5%) in association with running/jumping, and by 3,228 (7.5%) who had symptoms associated with urgency (Table 2). During pregnancy, leakage of droplets was much more common than leakage of larger amounts regardless of triggering situation, with 2,140 (4.9%), 966 (2.2%) and 919 (2.1%) leaking “larger amounts”, respectively.

The prevalence of incontinence in pregnancy increased with increasing parity, BMI and age (Table 3). Among nulliparous women 9,586 (48.0%) were incontinent during pregnancy; still, the prevalence was significantly higher among parous women (66.6%). Adjusted analyses resulted in only minor reduction in ORs for all variables in the model.

Comparison of results before and during pregnancy

When comparing urinary incontinence before and during pregnancy in Table 1, the increase in prevalence is twofold for SUI and threefold for MUI (Table 1). “Coughing, laughing or sneezing” was the situation most strongly associated with an increase of prevalence of urinary incontinence during pregnancy. Table 2 shows that the increase in prevalence of symptoms during pregnancy was predominantly due to slight symptoms (Frequency “1-4 times a month” or “1 – 6 times a week” and “Droplets” for amounts).

Even though the absolute figures for urinary incontinence were much higher in pregnancy, the relative associations between incontinence and age or BMI were similar before and during pregnancy. The association between incontinence and parity, however, was weaker in pregnancy than before, and especially so for women of parity 2 or more (Table 3). However, parity still remained a strong risk factor for urinary incontinence in pregnancy.

Discussion

In this large population of pregnant women, the prevalence of any incontinence was doubled compared to the prevalence before pregnancy. The increase was due to the stress incontinence component, thus increasing SUI and MUI. Symptoms tended to be mild both before and during pregnancy. Parity was a strong risk factor among non-pregnant women, less so among pregnant women, whereas age and BMI were weak risk factors in this population of young women.

A major strength of this study was the size of the observational cohort. We did not come across any study this large concerning incontinence during pregnancy when searching PubMed (English language; adolescent, adult, middle aged; search term: “urinary incontinence” and “pregnancy”). Narrow confidence intervals strengthened the precision of the results.

MoBa invited all pregnant women in Norway to participate, underscoring that the target population of MoBa was a population-based and non-selected sample. The response rate

was 45%. The study population may not be representative of pregnant women during the investigated time period in every respect. There were, however, only minor differences between the MoBa participants and their births compared to the total number of births in the same period concerning distribution of demographic variables.[11] Even though the study population was representative of Norwegian pregnant women in many aspects, it is possible that there was a socioeconomic gradient that influenced prevalence estimates, as women in lower socioeconomic classes were underrepresented. The main selection was related to the rate of recruitment. Risk factors such as age, BMI and parity may be distributed differently in low income pregnant women. This may have introduced a bias, most probably towards a lower prevalence than in the total population. On the other hand, there is no reason to believe that there was a selection bias on the basis of incontinence status, since the MoBa was a survey covering many topics, and urinary incontinence questions only being a minor issue. We believe that effect estimates for the risk factors investigated in this study were not affected by a significant selection bias.

Our estimate of prevalence before pregnancy stems from a pregnant population, and this may introduce a bias, based on awareness, towards a higher prevalence. As mentioned, selection bias due to disease status is unlikely to occur. Additionally, large cohort studies from Australia and Norway have reported similar prevalence of urinary incontinence among a general population of women aged 18 to 50 years, with 24.2% and 25.0%, respectively.[2, 4] A wide range of prevalence figures has been presented among both nulliparous (5 – 39%) and parous (19 – 48%) women.[13-15] It does not seem likely that there is a large recall bias resulting in higher prevalence of urinary incontinence.

Prevalence of incontinence during pregnancy also varies widely in previous studies, with figures ranging from 4 – 53% among nulliparous women, and from 14 – 84% among parous women.[7, 8, 14, 16-18] Our prevalence estimate of 58.1% of incontinence during pregnancy distributed unevenly on three types of urinary incontinence was based on real time report of symptoms in a large, unselected population, similar to figures reported in other prospective studies of pregnant women. [6, 19, 20]

Epidemiologic data are scarce on cumulative incidence of urinary incontinence during pregnancy. We reported a cumulative incidence of 45% of any incontinence, which is higher than earlier reported (12% and 16.7%).[14, 21] However, both studies were based on recall data, which may have influenced the estimate. The increase of incontinence in pregnancy was mostly due to increased prevalence of SUI and MUI. This is in line with findings in previous studies that have investigated impact of pregnancy on type of incontinence.[18, 22, 23] Several studies on incontinence during pregnancy have reported data on stress incontinence only, with estimates between 9 – 85%[7, 16, 22, 24, 25] The different prevalence estimates could partly be explained by use of questionnaires at different time points during pregnancy, by retrospective/prospective design and by use of subjective/objective measurements. Our estimate of 32.3% was in the middle of the published range. Pregnant women were less likely to run and jump, which may explain why the prevalence of incontinence in such situations increased only moderately during pregnancy. We used a low severity threshold to include incontinent women. Our urinary incontinence definition was based on terminology from the International Continence Society.[12]

Although the questionnaire itself was not specifically validated, the questionnaire used the answer options “Droplets” or “Larger amounts” to measure amount of leakage. In Norwegian, the common understanding of these answering alternatives would be close to the phrasing in the validated Sandvik’s Severity Index.[26] Few previous studies have looked into changes in severity of symptoms as a result of pregnancy. Women in our study generally reported mild symptoms, both before and during pregnancy. This finding is in line with results from other studies.[6, 8, 19, 24] This implies that incontinence in pregnancy should not be regarded as a major problem as such. However, a recent study suggests that incontinence in pregnancy may be a risk for incontinence later in life.[27]

Age, parity and BMI are three main risk factors for incontinence in younger women.[4, 6, 7, 13-15, 17, 28] In the present study, adjusted analyses showed that parity was the strongest risk factor for urinary incontinence among both non-pregnant and pregnant women, with OR around two for parous women. This is in line with other studies.[19, 25, 29] Some authors have found a certain threshold for the number of deliveries as risk factor for incontinence.[15, 30] Our findings support that the first delivery has the strongest impact on urinary incontinence before a new pregnancy, but subsequent deliveries also add to the risk for incontinence. However, the association with parity was less strong among pregnant women, indicating that pregnancy itself becomes a more important risk factor for incontinence when pregnant.

Studies have shown that having incontinence before pregnancy is a significant risk factor of incontinence during pregnancy.[6, 14] It was not surprising that women, who were incontinent at the start of pregnancy, did not get better in pregnancy. However, women who had been incontinent previously, but were continent at the start of pregnancy, represent an interesting group. It is not clear from previous studies if this group was at increased risk of incontinence during pregnancy. Our data did not allow us to distinguish between these two groups of women with incontinence in this situation.

In conclusion, this large study of pregnant women confirmed that incontinence in pregnancy is highly prevalent. The increase of prevalence compared to the non-pregnant state was mainly due to stress and mixed incontinence. Generally, pregnant women had mild symptoms. In pregnancy, parity was less strongly associated with incontinence compared to the prepregnancy state, probably because pregnancy becomes a strong risk factor in itself. The risk of longstanding and progressively more severe incontinence among women who were incontinent during pregnancy, should be investigated in further studies.

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Table 1. Prevalence of incontinence among all women before and during pregnancy

Parity group	**Continence status**	**Type of incontinence**	**Before pregnancy**		**During pregnancy**	
			N	*%*	*N*	*%*
All women			43279		43279	
	Continent		30631	70.7	17160	39.6
	Missing		1354	3.1	998	2.3
	Any incontinence		11294	26.2	25121	58.1
		Stress incontinence	7269	16.9	15961	36,9
		Urge incontinence	1637	3.8	2083	4,8
		Mixed incontinence	2361	5.5	7077	16.4
Nulliparous			19981		19981	
women	Continent		16268	81.4	9916	49.6
	Missing		630	3.2	479	2.4
	Any incontinence		3083	15.4	9586	48.0
		Stress incontinence	1736	8.7	6171	30.9
		Urge incontinence	789	3.9	1072	5.4
		Mixed incontinence	585	2.8	2343	11.7
Parous			23298		23298	
women	Continent		14363	61.6	7244	31.2
	Missing		724	3.1	519	2.2
	Any incontinence		8211	35.2	15535	66.6
		Stress incontinence	5560	23.9	9790	42.0
		Urge incontinence	848	3.6	1011	4.3
		Mixed incontinence	1803	7.7	4743	20.3

Table 2. Prevalence of incontinence before and during pregnancy according to situation of leakage, frequency and amount*.*

		Before pregnancy		**During pregnancy**	
		N	*%*	*N*	*%*
Urinary incontinence when laughing/sneezing/coughing		8314	19.2	22360	51.7
Frequency	1-4 / month	6219	14.4	11748	27.1
	1-6/ week	1401	3.2	6395	14.8
	≥1/ day	663	1.5	2978	6.9
Amount	Droplets	7525	17.4	16501	38.1
	Larger amount	504	1.2	2140	4.9
Urinary incontinence when running/jumping		4852	11.2	7001	16.2
Frequency	1-4 / month	3524	8.1	3629	8.4
	1-6/ week	785	1.8	1973	4.3
	≥1/ day	322	0.7	966	2.2
Amount	Droplets	3898	9.0	4936	11.4
	Larger amount	498	1.2	966	2.2
Urinary incontinence accompanied by urge		3998	9.2	9160	21.2
Frequency	1-4 / month	3014	7.0	5016	11.6
	1-6/ week	519	1.2	2242	5.2
	≥1/ day	240	0.6	986	2.3
Amount	Droplets	3182	7.4	6247	14.4
	Larger amount	396	0.9	919	2.1

* Due to missing values, percentage of frequency and amount do not add to the total prevalence for each symptom

Table 3. Prevalence of incontinence before and during pregnancy according to age, parity and body Mass index (BMI). Unadjusted and adjusted odds ratios (OR) with 95% confidence intervals (CI). P-value ≤ 0.001 for all estimates.

	Before pregnancy							**During pregnancy**						
	All	*Incontinent women*		*Unadjusted OR (95% CI)*		*Adjusted[#] OR (95% CI)*		*All*	*Incontinent women*		*Unadjusted OR (95% CI)*		*Adjusted[#] OR (95% CI)*	
	N	n	%					N	n	%				
Age														
≤ 26	11019	2070	19	1	(Reference)	1	(Reference)	11019	5568	51	1	(Reference)	1	(Reference)
27-30	14489	3561	25	1.4	(1.3 – 1.5)	1.1	(1.0 – 1.2)	14489	8218	57	1.3	(1.2 – 1.4)	1.1	(1.0 – 1.2)
31-34	11823	3541	30	1.9	(1.8 – 2.0	1.2	(1.1 – 1.3)	11823	7370	62	1.6	(1.6 – 1.7)	1.2	(1.1 – 1.3)
≥ 35	5945	2122	36	2.4	(2.3 – 2.6)	1.4	(1.3 – 1.5)	5945	3964	67	2.0	(1.9 – 2.1)	1.4	(1.3 – 1.5)
Parity														
0	19981	3083	15	1	(Reference)	1	(Reference)	19981	9586	48	1	(Reference)	1	(Reference)
1	14362	4662	33	2.7	(2.5 – 2.8)	2.5	(2.4 – 2.7)	14362	9471	66	2.1	(2.0 – 2.2)	2.0	(1.9 – 2.1)
≥ 2	8936	3549	40	3.7	(3.5 – 3.9)	3.3	(3.1 – 3.5)	8936	6064	68	2.4	(2.2 – 2.5)	2.1	(2.0 – 2.2)
BMI*														
< 20	5084	1070	21	1	(Reference)	1	(Reference)	2183	1090	50	1	(Reference)	1	(Reference)
20-24	23300	5734	25	1.2	(1.1 – 1.3)	1.2	(1.1 – 1.2)	21271	11799	56	1.3	(1.2 – 1.4)	1.2	(1.1 – 1.3)
25-30	9372	2680	29	1.5	(1.4 – 1.6)	1.3	(1.2 – 1.5)	12485	7563	61	1.6	(1.4 – 1.7)	1.4	(1.2 – 1.5)
> 30	4179	1437	34	2.0	(1.8 – 2.1)	1.8	(1.6 – 2.0)	5148	3375	66	1.9	(1.8 – 2.2)	1.7	(1.5 – 1.9)

[#] Adjusted for the other variables in the table.

* Outliers in BMI are excluded