Prevalence and predictors of double incontinence one year after first delivery

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Abstract

Introduction and hypothesis Urinary- (UI) and anal incontinence (AI) are common pelvic floor disorders (PFD), and postpartum women experiencing double incontinence (DI), the combination of UI and AI, tend to have more severe symptoms and greater impact on quality of life. Our objective was to investigate the prevalence and predictors of postpartum DI and UI alone one year after first delivery.

Methods In this prospective cohort study, 976 women reported the prevalence of DI and UI alone one year after their first delivery in one of two hospitals in Norway using the St. Marks score and the ICI-Q UI SF.

Results DI was significantly reduced from 13% in late pregnancy to 8% one year later, whereas 30% reported UI at both time points. Incontinence in late pregnancy predicted incontinence one year after delivery. Higher age was associated with UI alone. Compared to caesarean delivery, normal vaginal or instrumental delivery increased the risk of UI alone more than three and four times, respectively. Obstetric anal sphincter injuries showed a four-fold increase in risk of DI.

Conclusions Nearly 50% reported incontinence symptoms one year after first delivery. Continence status during pregnancy was one of the main predictors of postpartum continence status. Mode of delivery increased the risk of postpartum UI, whereas obstetric anal sphincter injuries increased the risk of postpartum DI.

Key words

Anal incontinence, double incontinence, postpartum, predictors, urinary incontinence

Brief summary

Nearly half of women reported urinary or double incontinence one year postpartum. Incontinence in pregnancy and delivery-related factors predicted postpartum incontinence.

Introduction

Urinary- (UI) and anal incontinence (AI) are the most commonly reported pelvic floor disorders (PFD). PFDs have a negative effect on quality of life, and may result in significant physical and emotional distress, including depression, loss of self-esteem, and social isolation.[1] The financial burden of management and rehabilitation of UI alone annually exceeds 20 billion dollars in the US, which is similar to, or higher than the estimated annual cost of conditions such as arthritis, breast cancer, pneumonia and influenza. Further, the worldwide burden of incontinence is estimated to increase significantly over time as life expectancy is still rising [1]. The aetiology of incontinence is multi-factorial. However, pregnancy and vaginal delivery are recognized as major risk factors among young healthy women. Approximately 50% of women experience UI for the first time during pregnancy, and one in three report postpartum UI.[2,3] Similarly, 17% report leakage of solid or loose stool at some point during the first year postpartum,[4] and the majority of multiparous women experiencing postpartum AI report the onset of their AI symptoms in relation to the delivery of their first child.[5] Studies suggest that women of reproductive age have insufficient knowledge about incontinence and available preventative and curative interventions such as pelvic floor muscle training (PFMT), and are thus unprepared when experiencing these symptoms in pregnancy or postpartum.[6,7] In a recent Australian study, only 8 of 230 (3%) pre-, and postnatal women referred for follow-up due to PFDs had AI as their primary reason for referral. After screening for PFD symptoms, AI was identified in 59 (25%) of the 230 women included in the study.[8] The frequently reported co-existence of PFDs suggests an association between different PFDs, and between UI and AI in particular.[9] Women experiencing double incontinence (DI), the combination of UI and AI, tend to have more severe AI and UI symptoms than those experiencing UI or AI only,[10] and DI is shown to have a greater impact on physical activity, psychosocial wellbeing, and quality of life than experiencing symptoms of UI or AI alone.[11] The main aims of the present study were to investigate the prevalence of postpartum DI, and variables associated with experiencing DI or UI compared to being continent one year after first delivery.

Materials and methods

Women who gave birth to their first child in two hospitals in separate health regions in Norway were invited to participate in a prospective cohort study in the period May 2009 to December 2010 prior to discharge home after delivery. Recruitment details have been described elsewhere.[12]

Participants answered questions about AI and UI symptoms experienced in the last four weeks in pregnancy and one year postpartum on the St. Mark's score [13] and the ICI-Q UI SF score,[9] respectively. Non-responders received a postal reminder with the same questionnaires after four weeks. Background information was collected from the participants' hospital medical records. UI was defined according to the standardized terminology for female pelvic floor dysfunction as "complaint of involuntary loss of urine[14] i.e. scoring more than 1 point on the ICI-Q UI SF score (Women reporting UI more than once weekly, or UI symptoms affecting quality of life more than 1 point on a 10 point scale). AI was defined as reporting incontinence of stool monthly or more, incontinence of flatus weekly or more, or combinations of two or more incontinence symptoms including fecal urgency on the St. Mark's score. DI was defined as experiencing both UI and AI. Participants were categorized into either continent (no incontinence symptoms), UI only (UI symptoms, no AI) or DI (UI and AI combined). Age was categorized based on the 10^{th}, 50^{th} and 90^{th} percentiles and Body Mass Index (BMI, kg/m^2) in late pregnancy was calculated and categorised as recommended by the World Health Organisation (normal: 18.4-24.9, overweight: 25.0-29.9, obese class I: 30.0-34.9, and obese class II: 35.0 and over). Delivery-related data such as mode of delivery and grade of perineal tears / obstetric anal sphincter injuries (OASIS) were collected form medical records. Birthweight was dichotomized into to under or over 4000 grams.

Statistical analyses

Prevalence was calculated with 95% confidence intervals (CI). The total mean of missing data in the outcome measures was between 0.2% and 2.2% for the outcome measures St. Marks score and ICI-Q UI SF score. Thus, a simple imputation procedure using the mean score value when replacing missing values in outcome items on the St. Mark's score of completed questionnaires was chosen. The background data was not imputed. The independent samples t-test was used when comparing means of continuous variables at baseline, the paired t-test was used when comparing means of continuous

variables recorded in late pregnancy and one year after delivery. The chi-square test was used when comparing two categorical variables recorded at the same time points. A significance level of 5% was used throughout. The relationship between continence status at one year postpartum as the dependent variable with more than two levels (Continent, UI alone and DI), and the various independent aetiological variables such as age, previous history of incontinence and mode of delivery were assessed using multinomial logistic regression analyses with Continent as the reference value. Variables found to be significant in the univariate analyses were included in the multivariate analyses. Results are presented as odds ratio (OR) with 95% CI. No effect of multicollinearity was seen. All statistical analyses were performed using IBM SPSS Statistics version 21 (IBM, Armonk, NY, USA) and Microsoft Excel for Windows® 2010 (Microsoft Corporation, Redmond WA, USA).

Ethics

Participants received written and/or verbal information about the study and written consent was obtained prior to inclusion in the study. The study is registered at clinicaltrials.gov (NCT00970320), and was approved by the Norwegian Regional Committees for Medical and Health Research Ethics Central (No.(6)2008.1318) and the Norwegian Social Science Data Services.

Results

Of the 1571 included primiparae, 1031 responded at both time points. The study group has previously reported on the prevalence and predictors of AI one year after first delivery,[12] and the 55 women reporting AI alone were thus excluded from further statistical analyses. There were no significant differences in delivery-related variables between the responders at both time points and those responding at inclusion / in late pregnancy only. However, women responding at both time points were significantly older, smoked less and had a higher educational level as previously reported.[12] There were no significant differences in mean age between groups. Compared to women continent at 12 months postpartum, , BMI in late pregnancy was significantly higher in the DI group (p=.001). Nearly one in five women continent at 12 months postpartum delivered by cesarean section (18.6%), and three in four women experiencing UI symptoms alone had spontaneous vaginal deliveries (Table 1). There was a significant reduction in women reporting DI (13.0% vs 8.0%, p<.001) from late

pregnancy to one year postpartum, whereas UI alone was reported by one in three women at both time points (p=.442) (Table 2). The mean St. Mark's score among women reporting AI alone was 3.9 (standard deviation (SD) 3.4) points and 5.3 (SD 3.1) points in late pregnancy and one year after delivery, respectively (data not shown).

Experiencing UI alone at 12 months postpartum was associated with vaginal delivery with or without instrumental assistance. Women older than 34 years at delivery had an increased risk of UI alone. Experiencing any incontinence in late pregnancy significantly increased the odds of being incontinent postpartum. In addition, OASIS was the only delivery-related factor significantly associated with postpartum DI (Table 3).

Discussion

The results from this prospective cohort study showed that the prevalence of DI was significantly reduced from 13% in late pregnancy to 8% one year later, whereas one in three first time mothers reported UI symptoms in late pregnancy as well as one year postpartum. Experiencing incontinence in late pregnancy predicted incontinence one year after delivery, and higher age was associated with UI alone. Normal vaginal or instrumental delivery increased the risk of UI more than three and four times, respectively, when compared to caesarean delivery, whereas OASIS was associated with a four-fold increase in risk of DI.

The prevalence of UI and DI reported among the first time mothers aged between 19 and 42 years in the present study was similar to previous findings.[15,16] The complaint of any UI may be considered to be a low threshold for UI and DI, however, the included women were all young and healthy first time mothers and thus any involuntary loss of urine could be a potential problem in this group. We found normal vaginal delivery, and deliveries complicated by vacuum or forceps in particular, to be associated with an increase in risk of UI one year after first delivery. This is in concurrence by the findings by Hatem and co-workers who reported caesarean section to be associated with a reduction in risk of UI six months after first delivery. Furthermore, they found that women sustaining OASIS at delivery were at increased risk of postpartum UI as well as DI.[15] OASIS was strongly associated with DI in the present study. However, we found no significant association between mode of delivery

and DI. Espuna-Pons and co-workers (2012) on the other hand found that mode of delivery, and instrumental delivery in particular, was associated with an increased risk of DI in the early postpartum period.[10] Similar to our findings, women aged 35 or older at first delivery had more than a two-fold risk of postpartum UI six weeks after delivery. Similar to previous short and long-term follow-up studies,[17,18] the only factor strongly associated with both UI and DI was incontinence during pregnancy. Thus it may be that pregnancy-related hormonal and mechanical alterations as well as neuromuscular changes in pelvic floor function and support may influence postpartum incontinence more than delivery-related factors.

The prevalence of incontinence is reported to increase with age. A Dutch study including a female population aged 45 to 85 years found that 10% reported DI with no flatal incontinence, whereas 35% reported DI when flatus incontinence was included in the definition. Only 26% reported no UI symptoms, and more than half reported one or more symptoms of AI in this age group.[19] The recent study by Tucker and co-workers (2017) found that women with DI reported higher St. Mark's scores than women reporting AI alone.[8] In the present study, the ICI-Q UI SF scores were higher amongst women with DI compared to women experiencing UI alone in late pregnancy as well as one year after delivery. Despite the significant reduction in the prevalence of DI in the same period, the reported St. Mark's scores and symptom severity increased from late pregnancy to one year later in the DI group. The reported reduced prevalence in DI may be associated with the reduction in overall AI previously reported in this cohort,[12] However, DI, the combination of UI and AI, is considered to be one of the most severe of PFDs. The comorbidity of urge UI and faecal urgency reported in the literature may be explained by direct injury to the pelvic floor muscles, injury or stretch of the pudendal nerves, and the presence of crossed reflexes between the pelvic floor, anorectum, bladder and urethra shown in animal studies.[20] Furthermore, the severity of incontinence symptoms has been shown to be associated with reductions in quality of life,[21] and in particular, women experiencing DI have significantly poorer quality of life compared to women experiencing UI or AI alone.[19,11] It is believed that the impact of PFDs may be modulated by adaptive behaviours such as limiting travelling, social and physical activities as well as always carrying a change of clothing in order to mitigate symptoms and avoid

embarrassment.[16,22] Women experiencing AI tend not to report these symptoms unless asked directly, and few health care practitioners ask questions about incontinence symptoms.[16] A recent study showed that 68% and 2% of women of reproductive age referred to a Continence Nursing Service had UI or DI as their primary reason for referral, respectively. Following a phone consultation, DI was confirmed in just over 17%. Among the 59 women reporting DI, 86% had not disclosed these symptoms before. Previous studies have shown that patients tend to report more details of their experiences with incontinence in postal or self-administered questionnaires as compared to face-to-face interviews or in clinical settings.[23] However, substantial agreement was found between self-administered and interview-based reports of postpartum AI symptoms among young postpartum women.[24] Thus, it may be that mapping incontinence symptoms using self-administered questionnaires in pregnancy may be an appropriate basis for discussions about incontinence between pregnant women and health professionals such as midwives, doctors and physiotherapists.

In a study including morbidly obese women with BMI over 40 seeking evaluation for bariatric surgery, more than 30% reported AI, and AI was found to predict UI and severity of UI symptoms.[25] Previous studies have identified high BMI and retaining weight gained during pregnancy as factors increasing the risk of postpartum UI.[26] Few studies have explored the possible association between AI, DI, and BMI or weight retention. However, the present study found that more women experiencing DI had a high BMI in late pregnancy adding to the knowledge base concerning benefits of limiting weight gain and weight retention during and between pregnancies in overweight or obese women with appropriately growing fetuses.[27] Incontinence may result in reduced levels of physical activity. Reduced levels of physical activity may in turn lead to increased risk of weight gains in pregnancy, weight retention between pregnancies, and adverse outcomes in later pregnancies or deliveries, as well as more severe incontinence.[26,28] Being pregnant is highly demanding on the pelvic floor. Even though pregnancy-related hormonal changes may be protective to pregnancy-induced weight gains, as opposed to hormonal changes associated with adiposity, the pregnancy-related hormonal changes may result in reduced supportive function and muscle strength in the pelvic floor muscles.[25,26] Further, direct and indirect trauma to the pelvic floor structures and nerve

pathways following vaginal delivery have a negative impact on pelvic floor function.[2,8] PFMT is recognized as an effective first line prevention and treatment for pre and postpartum UI,[29] and recent studies have shown promising results with regards to the effect of PFMT in treating postpartum AI.[30] In addition, an Australian cross-sectional study found that pregnant women attending antenatal classes had significantly more knowledge about risk factors of incontinence, and the preventative as well as curative effect of PFMT compared to women who did not attend antenatal classes.[7] Pregnant women are regularly in touch with health care providers, and each pregnancy is therefore a unique opportunity to educate these women. Considering the reported prevalence of PFDs in women, introducing routine inquiries about UI and AI in maternal health care services during pregnancy and after delivery may increase awareness and knowledge about prevalence and risk factors for PFDs among both women and health care providers. This increased knowledge may result in early diagnosis and treatment of symptoms, and ultimately a reduction of the long-term consequences of PFDs.[1,7,16,25]

The main strengths of the present study include the large sample size, the use of validated questionnaires [9,13,24] and the prospective cohort design enabling exploration of possible associations influencing the risk of postpartum incontinence. One of the limitations in the present study is the response rate as just under half of the primiparae delivering in the two participating hospitals responded to our initial questionnaire in late pregnancy. Even though our response rate is comparable or higher to similar studies,.[15,16,26] the response rate may have influenced our findings and the results must be interpreted with caution. Another limitation is that due to practical limitations we recruited primiparous women prior to discharge home from hospital after delivery. Thus we were only able to evaluate the influence of experiencing incontinence in late pregnancy in postpartum incontinence. Recruiting women at an earlier stage or even prior to pregnancy may have provided more information on the influence of pregnancy-related compared to delivery-related factors associated with the mechanisms of postpartum incontinence.

Conclusion

Overall, nearly half of the participating women reported incontinence symptoms one year after first delivery. Continence status during pregnancy was one of the main predictors of postpartum continence status. Mode of delivery and obstetric anal sphincter injuries were found to be associated with postpartum UI and DI, respectively.

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Legend of Figures

Figure 1. Flow chart of the study population

Table 1. Characteristics of women reporting being continent or experiencing urinary or double incontinence 12 months postpartum (n=976)

	Continent (n=594)	**UI alone (n=300)**		**DI (n=82)**	
			Continent vs. UI alone (p-value)		Continent vs. DI (p-value)
Age, mean years (SD) [range]	28.6 (4.2) [19,42]	29.8 (4.6) [18,42]	.487*	28.1 (4.7)[19,39]	.119*
18 – 23.5 years	62 (10.4)	22 (7.3)	**.<001*****	16 (19.5)	.443***
23.6 - 28.6 years	255 (42.9)	101 (33.7)		28 (34.1)	
28.7 – 34.7 years	229 (38.6)	135 (45.0)		31 (37.8)	
34.8 years and over	48 (8.1)	42 (14.0)		7 (8.5)	
Education			.062***		.386***
Elementary level	12 (2.0)	5 (1.7)		6 (7.3)	
Upper secondary school	166 (27.9)	67 (22.3)		21 (25.6)	
Higher education	397 (66.8)	218 (72.7)		52 (63.4)	
Unknown	19 (3.2)	10 (3.3)		3 (3.7)	
Body Mass Index (BMI) in late pregnancy					
Obese class II (BMI over 35)	45 (7.6)	32 (10.7)	.110**	14 (17.1)	**.001****
Missing	94 (15.8)	49 (16.3)		19 (23.2)	
Pregnancy duration, mean weeks+ days (w+d) (SD)	40w+0d (12d)	40w+1d (11d)	.201*	40w+1d (10d)	.689*
Presentation			.147***		.978***
Occiput anterior	516 (86.9)	270 (90.0)		71 (86.6)	
Occiput posterior or other presentation	78 (13.1)	29 (9.7)		11 (13.4)	
Missing	3 (0.5)	1 (0.3)		0	
Active pushing, mean minutes (SD)	40 (26)	41 (26)	.520*	42 (29)	.240*
Missing	87	16		10	
Mode of Delivery			**.007*****		.699***
Spontaneous vaginal delivery	389 (65.5)	222 (74.0)		55 (67.1)	
Vacuum assisted delivery	89 (15.0)	54 (18.0)		17 (20.7)	
Forceps assisted delivery	5 (0.9)	4 (1.3)		1 (1.2)	

Casarean section, total	111 (18.6)	20 (6.7)		9 (11.0)	
Elective caesarean section	19 (3.2)	2 (0.7)		1 (1.2)	
Acute caesarean section	92 (15.5)	18 (6.0)		8 (9.8)	
Episiotomy	133 (22.4)	77 (25.7)	.162**	21 (25.6)	.585*
Missing	5 (0.8)	1 (0.3)		0	
Epidural	206 (34.7)	102 (34.0)	.885**	26 (31.7)	.868*
Missing	21 (3.5)	9 (3.0)		3 (3.7)	
Perineal tear (vaginal delivery)			**<.001*****		.083***
No perineal tear	397 (66.8)	155 (51.7)		49 (59.8)	
Perineal tear grade 1	96 (16.2)	67 (22.3)		12 (14.6)	
Perineal tear grade 2	85 (14.3)	63 (21.0)		12 (14.6)	
OASIS / perineal tear grade 3	15 (2.5)	15 (5.0)		8 (9.8)	
OASIS / perineal tear grade 4	1 (0.2)	0		1 (1.2)	
Birthweight, mean grams (SD)	3441 (493)	3464 (544)	.523*	3470 (507)	.631*
Birthweight ≥ 4000g	77 (13.0)	46 (15.3)	.331**	10 (12.2)	.846**
Head circumference, mean cm (SD)	35.0 (1.7)	34.9 (1.7)	.573*	34.9 (1.4)	.464*
Incontinence scores mean points (SD) [range]					
St. Mark's score late pregnancy	2.0 (2.5) [0,17]	2.2 (2.8) [0,18]	.172*	4.2 (4.2) [0,16]	**<.001***
St. Mark's score one year after delivery	.87 (1.5) [0,6]	1.3 (2.7) [2,17]	**<.001***	5.4 (3.6) [1,17]	**<.001***
ICI-Q UI SF score late pregnancy	1.4 (2.5) [0,4]	3.7 (3.5) [0,17]	**<.001***	4.6 (3.9) [0,18]	**<.001***
ICI-Q UI SF score one year after delivery	0.1 (0.1) [0,1]	5.1 (2.7) [2,17]	**<.001***	6.8 (3.7) [2,17]	**<.001***

n (%) are presented unless otherwise stated;

*Independent sample's t-test comparing continent versus UI or DI at 12 months postpartum; **Chi-squared test comparing continent versus UI or DI at 12 months postpartum,

***Mann-Whitney U test comparing continent versus UI or DI at 12 months postpartum

Table 2. Continence status in late pregnancy and one year after delivery among first time mothers (n=1031).

	Late pregnancy (n=1031)	**One year after delivery (n=1031)***	**p***
	n (%) [95% CI]	n (%) [95% CI]	
Continent	468 (48.0) [44.8-51.1]	594 (60.9) [57.5-63.9]	<.001
Urinary incontinence alone	308 (31.6) [28.7-34.4]	300 (30.7) [27.7-33.8]	0.442
Double incontinence	127 (13.0) [10.8-15.3]	82 (8.4) [6.8-10.2]	<.001

[a] Test for equal proportions

Table 3. Variables associated with experiencing urinary or double incontinence compared to being continent 1 year postpartum.
Results from multivariate multinomial logistic regression analyses (n=976)

	Urinary incontinence alone (n=300) vs. continent (n=594)	**Double incontinence (n=82) vs. continent (n=594)**
	OR (95% CI)	OR (95% CI)
Age		
18 - 23.5 years	0.5 (0.4, 1.1)	2.4 (0.8, 7.2)
23.6 - 28.6 years	1	1
28.7- 34.7 years	0.7 (0.4, 1.1)	0.9(0.4, 2.3)
34.8 years and over	**0.4** (0.2, 0.7)*	0.8 (0.3, 2.1)
Incontinence status in late pregnancy		
Continent	1	1
Urinary incontinence alone	**4.5** (3.2, 6.4)**	**6.1** (3.1, 12.1)**
Double incontinence	**5.2** (3.2, 8.4)**	**19.6** (9.5, 40.1)**
Mode of Delivery		
Caesarean section	1	1
Normal vaginal delivery	**3.7** (2.1, 6.4)**	1.7 (0.8, 4.1)
Instrumental delivery	**4.7** (2.5, 9.0)**	2.4 (0.9, 6.4)
Perineal tear		
Perineal tear grade 0-2	1	1
Perineal tear grade 3 and 4 (OASIS)	1.3 (0.6, 3.0)	**3.9** (1.4, 10.8)*

*p< .05; ** p<.001