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Is urinary incontinence during and after pregnancy related to family history? A web-based survey among postpartum women (motherfit project)

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Summary

Purpose of investigation: The authors studied whether family history of urinary incontinence (UI) is associated with pre- and postpartum UI. *Materials and Methods:* In 2010, Dutch postpartum women at three months were approached to fill in a Web-based questionnaire on UI and risk factors (body mass index, BMI), parity, pelvic organ prolapse, and family history. Results were analyzed with Chi-square and logistic regression analyses. *Results:* 162 (61%) questionnaires were analyzed, 76 (47%) women reported UI before, during and/or after pregnancy, of which 34% also reported a UI family history. Sixteen (19%) out of 84 women without UI reported UI family history (p = 0.05). BMI was associated with prepartum UI (p = 0.035), but the association disappears when adding family history. Women with unknown UI family history had higher risk for postpartum UI. *Conclusion:* UI family history is associated with UI during pregnancy. More awareness and research is needed whether adding family history questions on UI in prepartum consultations improves timely prevention.

Key words: Urinary incontinence; Family history; Hereditary; Pregnancy; Postpartum period; Body mass index; Prevention.

Introduction

During pregnancy, 32% to 64% of women experience urinary incontinence (UI) and at one year postpartum, 15% to 30% still experience UI [1]. UI is defined as the complaint of any involuntary leakage of urine [2] and affects one in three women during their life [3]. UI brings along high costs in terms of impact on health related quality of life and costs for surgery and its complications [4, 5]. Effective treatment is available for the most prevalent types of UI such as lifestyle advice, bladder training, and pelvic floor muscle training (PFMT) [6]. However, help-seeking patients are mostly only prescribed absorbent pads [7].

Understanding the cause of this common health problem is critical to improve treatment and prevention. Pregnancy and vaginal delivery are potential inciting factors to alter the pelvic floor function and contribute to UI [8], as well as increased body mass index (BMI), physically heavy work, and maternal age [9]. Some studies have shown that specific genotypes and chromosome expression can predispose for pelvic floor dysfunctions and are correlated with UI [8, 10]. A hardly studied predisposing risk factor for UI is family history. In a recent Catalan study, besides age and BMI, family history was significantly correlated with UI during pregnancy [11]. Ertunc *et al.* found a prevalence of stress urinary incontinence (SUI) of 71.4% among mothers and 24.6% among sisters of women who had surgery for SUI, compared with 40.3% among mothers and 11.6% among sisters of continent women [12]. Furthermore, UI started significantly younger in 'incontinent families' [12]. These findings suggest a genetic influence on pelvic floor disorders including UI [10, 13]. Currently, few studies are published to identify the role of genes and the onset of UI. For example, Söderberg *et al.* concluded that women with SUI have a decreased gene signal and weaker immune-reactivity for fibrillin, important for elasticity [10]. A loss of elasticity in tissue can lead to pelvic floor disorders like UI and pelvic organ prolapse (POP).

Obviously hereditary factors do play a role in the development and occurrence of pelvic floor disorders. Family history taking is not uncommon in primary healthcare. For instance, family doctors routinely ask for family history in cardiovascular diseases. This is a relatively simple and low cost risk assessment that reflects predisposing factors such as hereditary factors, but also shared cultural and environmental factors that might be related to intervening factors such as BMI [14]. According to a review study about the use and outcomes of family history questionnaires, accurate family history information can be used to identify pop-

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Table 1. — *Characteristics of study population.*

Variable	Total n (%) n=162	UI during pregnancy n (%)		UI post partum n (%)	
		Yes n=65 (40)	No n=97 (60)	Yes n=52 (32)	No n=110 (68)
Age in years					
18-24	7 (4.3)	3 (4.6)	4 (4.1)	3 (5.8)	4 (3.6)
25-34	126 (77.8)	45 (69.2)	81 (83.5)	38 (73.1)	88 (80.0)
35-44	29 (17.9)	17 (26.2)	12 (12.4)	11 (21.2)	18 (16.4)
≥45	0 (0)	-	-	-	-
Education					
No or lower education	17 (10.5)	10 (15.3)	7 (7.3)	8 (15.3)	9 (8.9)
Intermediate vocational education	65 (40.1)	28 (43.1)	37 (38.1)	21 (40.3)	44 (40.0)
Higher vocational education	80 (49.4)	27 (41.5)	53 (54.6)	23 (44.2)	57 (51.8)
Smoking - missing values: 1					
No	148 (91.9)	60 (93.8)	88 (90.7)	47 (92.2)	101 (91.8)
Yes	13 (8.1)	4 (6.3)	9 (9.3)	4 (7.8)	9 (8.2)
Alcohol consumption					
No	94 (58.0)	36 (55.4)	58 (59.8)	27 (51.9)	67 (60.9)
Yes	68 (42.0)	29 (44.6)	39 (40.2)	25 (48.1)	43 (39.1)
Other diseases*					
Asthma or COPD	1 (0.6)	0 (0)	1 (1.0)	0 (0)	1 (0.9)
Hay fever, a lot of sneezing	25 (15.4)	9 (13.8)	16 (16.5)	8 (15.4)	17 (15.5)
Inguinal hernia or abdominal hernia	3 (1.9)	1 (1.5)	2 (2.1)	2 (3.8)	1 (0.9)
Varices	15 (9.3)	13 (20.0)	2 (2.1)	7 (10.3)	8 (7.3)
Thyroid defect	3 (1.9)	2 (3.1)	1 (1.0)	1 (1.9)	2 (1.8)
Persistent back disease	7 (4.3)	3 (4.6)	4 (4.1)	1 (1.9)	6 (5.5)
Arthrosis	1 (0.6)	1 (1.5)	0 (0)	1 (1.9)	0 (0)
Diabetes mellitus	1 (0.6)	0 (0)	1 (1.0)	0 (0)	1 (0.9)
Connective tissue disease	1 (0.6)	1 (1.5)	0 (0)	1 (1.9)	0 (0)
Other chronic diseases	11 (6.8)	3 (4.6)	8 (8.2)	3 (5.8)	8 (7.3)
No other diseases	94 (58.0)	32 (49.2)	62 (63.9)	28 (53.8)	66 (60.0)

*None of the women reported arthritis or other chronic rheumatism. UI = urinary incontinence, COPD: chronic obstructive pulmonary disease.

ulations at risk [15]. To the present authors' knowledge, studies about the association between family history and UI in pregnant and postpartum women are scarce.

The present authors hypothesize that a family history of UI is associated with UI during pregnancy and shortly after delivery. The risk factors maternal age, BMI, and physically heavy work are taken into account, as well as parity, cesarean birth and POP.

The aim of this study was to gain insight in the relationship between a family history of UI and UI during pregnancy and shortly after delivery.

Materials and Methods

Motherfit (www.motherfit.nl) [16], a quality improvement strategy in the Netherlands, is a multidisciplinary screening and supervised PFMT program for pregnant and postpartum women to prevent postpartum pelvic floor disorders. Timely information/education on lifestyle, healthy bladder and bowel behaviour, and intensive group PFMT supervised by registered pelvic physical therapists are provided. Special attention is paid to training principles, eg, adequate dose-response, type of training, training frequency, intensity, overload, follow-up, and adherence to the protocol [17]. In 2010, prior to the start of the motherfit program, a Web-based questionnaire was filled in by postpartum women to test the feasibility of the program. The women were approached by their midwife, gynecologist, family doctor or physical therapist and gave their informed consent. All postpartum women in the present pilot regions of 18 years and older who gave birth after 37 weeks gestation were eligible. These women delivered their baby two to three months before filling out the questionnaire. Reasons for exclusion or non-participation were registered by the health care professionals. Because women's participation was anonymous, reminding was impossible. Upon consultation, the Medical Ethics Committee of the Maastricht region, the Netherlands, stated that ethical approval was not needed given the non-invasive character of the survey. However, all participating women gave their informed consent to the health professionals that approached them for the survey.

Measurement instrument

Participants answered 198 questions: personal characteristics (eg, age, maternal age, education level, occupation, length, weight), general health (eg, prevalence of other diseases than UI), smoking, alcohol consumption, obstetrical history (parity, type of delivery), urogynecological history (of which five items about family history, UI, POP), pelvic floor disorders (93 items), knowledge, and experience with pelvic floor muscle exercises. Finally, to find barriers and facilitators for implementation of the motherfit program, women were asked for their perceptions of the motherfit program (the questionnaire is available on request). In the present study only the most relevant outcomes are presented to answer the study question.

Table 2. — *Comparison of women with and without UI during pregnancy and post partum on risk factors.*

Risk factors		Total n=162	UI during pregnancy N (%) Yes n=65 (40)	No n=97 (60)	*p*-value	UI post partum N(%) Yes n=52 (32)	No n=110 (68)	*p*-value
Maternal age *mean (SD)*		28.9 (3.5)	29.1 (3.8)	28.7 (3.2)	n.s.	28.8 (3.8)	29.0 (3.4)	n.s.
BMI (*4 missing*) *mean (SD)*		24.3 (4.8)	25.3 (6.1)	23.6 (3.6)	n.s.	24.9 (6.3)	24.1 (4.0)	n.s.
Parity *n (%)*	1	76 (46.9)	25 (38.5)	51 (52.6)		23 (44.2)	53 (48.2)	
	2	51 (31.5)	13 (33.8)	29 (29.9)	n.s.	15 (28.8)	36 (32.7)	n.s.
	3 or more	35 (21.6)	18 (27.7)	17 (17.5)		14 (26.9)	21 (19.1)	
Cesarean birth *n (%)*	No	136 (84.0)	53 (81.5)	83 (85.6)	n.s.	43 (82.7)	93 (84.5)	n.s.
	Yes	26 (16.0)	12 (18.5)	14 (14.4)		9 (17.3)	17 15.5)	
Pelvic organ prolapse	No	147 (90.7)	57 (87.7)	90 (92.8)	n.s.	44 (84.6)	103 (93.6)	n.s.
n (%)	Yes	15 (9.3)	8 (12.3)	7 (7.2)		8 (15.4)	7 (6.4)	
Physically heavy work	No	115 (71.0)	46 (70.8)	69 (71.7)		35 (67.3)	80 (72.7)	
n (%)	0-5 years	17 (10.5)	4 (6.2)	13 (13.4)	n.s.	5 (9.6)	12 (10.9)	n.s.
	> 6 years	30 (18.5)	15 (23.1)	15 (15.5)		12 (23.1)	18 (16.4)	
Family history	No	69 (42.6)	22 (33.8)	47 (48.5)		15 (28.8)	54 (49.1)	
n (%)	Yes	40 (24.7)	23 (35.4)	17 (17.5)	0.030	17 (32.7)	23 (20.9)	0.042
	I don't know	53 (32.7)	20 (30.8)	32 (33.0)		20 (38.5)	32 (29.0)	
UI during pregnancy	No	97 (59.9)				9 (17.3)	88 (80.0)	n.s.
n (%)	Yes	65 (40.1)				43 (82.7)	22 (20.0)	

BMI = body mass index. Four women did not fill in their weight. Therefore their BMI could not be calculated.
UI = urinary incontinence; n.s.= not significant, $p > 0.05$.

Outcome measures

The primary analysis was based on the question: 'Have you ever experienced urine loss during your last pregnancy (also if it was only a little bit)?' measured the prevalence of UI *during* pregnancy. The prevalence of UI *postpartum* was measured as: 'Have you ever experienced urine loss after your last delivery (also if it was only a little bit)?' Both questions were derived from the '3 Incontinence Questions' (3IQ), a simple, quick, and non-invasive symptom-based patient reported approach with acceptable accuracy for classifying UI and appropriate for use in primary care settings [17]. Answering categories were yes/no.

In secondary analysis, severity of UI is reported with the International Consultation on Incontinence Questionnaire Short Form (ICIQ-UI SF) [18]. This is a grade A, easy to use questionnaire which gives a severity sum-score of UI frequency, perceived UI quantity (weighted items), and the UI impact on quality of life (Visual Analogue Scale (VAS) score from zero (no impact) to ten (most severe impact) [18, 19]. Overall score ranges from zero (no UI) to 21 (most severe UI).

Risk factors for UI

Participants were asked for their age at their first delivery (maternal age). Furthermore, the authors asked for height and weight before their first pregnancy, in order to calculate the BMI (weight (kg)/height (m^2), parity, type of delivery (vaginal or cesarean birth), and whether they ever had experienced POP (seeing or feeling a bulge). The performance of physically heavy work was measured with: 'Did you regularly perform physically heavy work in the past? (a lot of lifting or bending or standing for a long time)' and the answers yes/no, and when yes, how many years they performed heavy work when they count all the years together. The answers were categorized in '0-5 years', '6-10 years', '11-15 years', and 'more than 15 years'. Because there was a low number of participants with a high number of years of physical work, answers were recoded in no physical work, 0-5 years, and more than 6 years.

Family history is measured as: 'Does or did your mother or your mother's mother ever experience UI?' Answering categories varied between 'yes', 'no', 'I don't know (anymore)'.

Analyses

First, the number and percentage of participants for each demographic variable were defined (Table 1). *T*-Tests and Chi-square tests were performed to compare women with and without UI and risk factors during pregnancy as well as postpartum (Table 2). In logistic regression analyses, three blocks were entered to analyse the relationship of maternal age, BMI, parity, cesarean birth, POP, physically heavy work, and finally family history with UI during pregnancy and UI after delivery. The women in the present group hardly reported other health problems during or after pregnancy, so no equation for these problems was relevant. A significant *p*-value was set at 0.05. The analyses were performed with the computer program PASW Statistics 18.

Results

Returned were 169 questionnaires (response rate 64%). One participant did not give birth and the results of six others were not correctly transferred from the web to the dataset, which led to 162 included women (Table 1). Most women are between 25 and 34 years, and 89.5% of the participants had either finished intermediate or higher occupational education. Hardly any other health problems were mentioned besides UI; hay fever or a lot of sneezing was most commonly experienced (Table 1). Women experiencing UI during pregnancy had more often varices than women who did not experience UI ($X^2 = 14.905$; df $= 1$; $p < 0.001$).

Of 76 women who reported UI at any moment, 52 had UI after the last pregnancy. Of these women 22 report UI before and during pregnancy and 21 UI started during pregnancy. Only nine women report the onset of UI after delivery. Of the 24 women who did not have UI postpartum, 17 had UI during their last pregnancy.

Table 3. — *Logistic regressions for the association between risk factors and UI.*

Block	UI during pregnancy				UI postpartum			
	OR	CI of 95%		*p*	OR	CI of 95%		*p*
		lower	upper			lower	upper	
Maternal age BMI	1.067	0.965	1.179	0.205	1.004	0.907	1.112	0.941
Parity	1.082	1.006	1.164	0.033	1.035	0.963	1.113	0.347
Cesarean birth	1.447	0.965	2.170	0.074	1.190	0.785	1.804	0.412
POP	1.034	0.414	2.584	0.942	0.861	0.328	2.258	0.761
R^2	1.754	0.561	5.489	0.334	2.631	0.872	7.943	0.086
	0.086				0.043			
Maternal age BMI	1.027	0.922	1.145	0.626	0.989	0.884	1.106	0.843
Parity	1.083	1.005	1.167	0.035	1.032	0.959	1.110	0.398
Cesarean birth	1.388	0.919	2.095	0.119	1.163	0.764	1.770	0.483
POP	1.114	0.437	2.841	0.822	0.878	0.332	2.324	0.793
Physical work	1.778	0.556	5.684	0.332	2.619	0.863	7.942	0.089
No physical work ref.								
in years: 0-5	0.368	0.096	1.416	0.146	0.776	0.220	2.741	0.694
> 6	1.445	0.598	3.494	0.414	1.434	0.586	3.510	0.430
R^2	0.113				0.051			
Maternal age BMI	1.034	0.926	1.155	0.553	0.983	0.876	1.102	0.768
Parity	1.079	0.999	1.165	0.053	1.027	0.953	1.107	0.484
Cesarean birth	1.230	0.797	1.899	0.349	1.071	0.686	1.673	0.762
POP	1.282	0.485	3.390	0.616	1.140	0.414	3.138	0.800
Physical work	1.541	0.468	5.070	0.477	2.423	0.777	7.555	0.127
No physical work ref.								
in years: 0-5	0.400	0.101	1.584	0.192	0.880	0.243	3.186	0.846
> 6	1.447	0.588	3.562	0.421	1.483	0.592	3.714	0.400
Family history (no FH is ref.)								
Yes	2.641	1.069	6.523	0.035*	2.399	0.935	6.157	0.069
I don't know	1.332	0.596	2.975	0.485	2.578	1.101	6.038	0.029*
R^2	0.149				0.100			

* statistically significant: $p < 0.05$. UI = urinary incontinence; OR = odds ratio; CI = confidence interval; BMI = body mass index;
R^2 = Coefficient of determination, POP = pelvic organ prolapse, for POP and cesarean birth, FH = family history: 0 = no (ref.) and 1 = yes.

Almost half of the women were primiparae. Women with three or more children reported more often UI during pregnancy or afterwards than women with fewer children, although not statistically significant ($p = 0.525$). UI and family history are significantly related both during and after pregnancy (Table 2).

Further analysis (not in table) shows that, of the 76 women who reported UI before and/or during and/or after pregnancy, 24 women (34%) reported a family history of UI and 52 were not aware of a family history or had no family history, whereas only 16 (19%) out of 84 women without UI reported a family history ($X^2 = 3.43$; df = 1; one-tailed $p = 0.05$). In the whole sample, 53 women were unaware of their UI family history and 69 women reported not having a family history of UI.

Table 3 shows the results of the logistic regression analyses that were performed to define the association between potentially mediating factors and UI. Table 3 also shows that BMI is significantly associated with UI during pregnancy ($p = 0.035$), (block 1 and 2), but the association disappears when family history is entered in the equation (block 3). Besides, BMI is not associated with UI postpartum. Of all the known risk factors, only family history is associated with UI during pregnancy ($p = 0.035$). Women with a mother or their mother's mother who has experienced UI had 2.6 times more often UI during their pregnancy. No significant relationship is found between family history and UI shortly after pregnancy. However, women who reported that they did not know whether their mother or their mother's mother had experienced UI did have a higher risk for UI shortly after pregnancy. This rather large group contains women with and without a family history of UI. Exploration of the relation between severity of UI (ICIQ-UI SF sum-score) and family history did not yield significant results (data not shown).

Discussion

First, results of the present study point at a significant role of family history as a determinant for UI during pregnancy, as reported earlier [11]. Other studies also show a relation between UI and family history/genetics [10, 12]. The relationship between family history and UI shortly after pregnancy is less clear. Second, a longer continuum

than often assumed (with UI starting during or after pregnancy) seems to exist of UI. Of 76 women who reported UI at any moment, 52 had UI after the last pregnancy and 22 of these women report UI already before and during pregnancy, and for 21 women UI started during pregnancy, whereas only nine women report the onset of UI after delivery. Third, interestingly for BMI, a statistically significant relationship with UI during pregnancy was seen which disappeared when family history was added to the regression. Vaginal delivery itself does not seem to cause the onset of UI for most women. In practice, focus is often directed towards mode of delivery and avoiding injury at delivery in order to prevent pelvic floor dysfunction including UI. For UI however, this may not be the main and only inciting factor. Later in life, pregnancy and vaginal delivery are found to disappear as a risk factor for UI [1], but women who *experience UI during pregnancy* are at higher risk for consistent UI and should be counseled on the importance of timely prevention of pelvic floor dysfunction [20]. Overweight is described as an independent modifiable risk factor for UI [11, 21]. The question is whether mothers' BMI before pregnancy or mothers' weight gain during pregnancy is relevant. Wesnes *et al.* found that weight gain during pregnancy was associated with UI during pregnancy but not after vaginal delivery [22]. The present authors found a significant role of BMI before pregnancy for the occurrence of UI during pregnancy, but only when family history was not included in the analysis. Possibly, family history also plays a role in BMI before pregnancy and hence, this may have confounded the positive relationship between BMI and UI during pregnancy in the same direction.

In the present study, 53 women were unaware of their UI family history, which supports earlier statements that patients are hardly aware of their family history [23]. However, family history may provide interesting information for early detection of populations at risk. Surely, the rather large 'I don't know'- group contained both women with and without a family history of UI, and this group had a significantly higher risk for UI after pregnancy. The number of women who did know their family history may have been too small to show a statistically significant relationship with UI after pregnancy.

Clinical implications

The present authors included one question to measure family history to assess the influence of the family history via the mother's (grand)mother, but sisters, fathers, as well as grandfathers can also experience UI. Potential risk factors for men are age, lower urinary tract symptoms and infections, functional and cognitive impairment, neurological disorders, and prostatectomy [1]. Therefore, including the sister's and father's history might increase the strength of the relationship between UI and family history, which may now be underestimated. Adding more questions about family history can increase validity and reliability.

Strength and limitations

Before drawing any conclusions on the basis of the present findings, the following needs to be considered. The study population of 162 postpartum women with an acceptable response rate of 62%, is comparable to the average Dutch population, with regards to the number of cesarean births, the average parity, and maternal age [24]. Selection bias for this Web-based survey seems unlikely since 95% of Dutch households have internet access and 94 to 98% of Dutch women aged between 16-54 use the internet weekly [25]. Women hardly reported physically heavy work. This reduces extrapolation of the results to women who do have heavy physical work. On the other hand, data were rather complete because the Web-based system did not allow for missing items on most questions.

One of the potential limitations of this study is that it relies on self-reported retrospective data instead of medical records. Consequently, there is a chance on recall bias where people report inaccurate or incomplete information for questions about UI in the past and family history [26]. Moreover, as the study is cross-sectional, the authors can only test for statistical associations and not for causal relationships.

Recommendations for research and clinical practice

The relationship between family history and pelvic floor disorders including UI must be further explored and a family history questionnaire for UI can assure validity and reliability of measurements. Accurate family history information can be used to identify populations at risk [15]. Family history is a known risk factor for many chronic diseases, including cancer, diabetes, and asthma [23]. For instance, a positive impact on cancer screening adherence was achieved with the use of family history questionnaires [15]. Therefore, a family history questionnaire may be an easy and inexpensive way to define risk groups for UI. Wilson *et al.* developed the, not yet validated, UR-CHOICE scoring system which provides women with prelabour advice regarding prevention of pelvic floor disorders. This system includes characteristics of mother and child, but also family history and pelvic floor disorders history [27]. If women are at risk of developing pelvic floor disorders, a multidisciplinary screening and supervised PFMT program like Motherfit [16] can be started. Next to this, longitudinal studies about the natural course of UI [9], and the relation of family history with other predisposing, inciting, and intervening factors for UI are needed. Therefore, both in primary and secondary obstetric care, the present findings may have clinical implications as family history may help to identify women at risk for UI.

Conclusions

Family history of UI is associated with UI during pregnancy. Awareness of relevant family history among researchers, healthcare providers, and the population is needed.

More research is needed whether adding family history questions on UI in prepartum consultations improves prevention of UI by a preventive pelvic floor muscle training program. This can improve quality of life of women and might reduce healthcare costs.

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