Mode of delivery and severe stress incontinence. a cross-sectional study among 2,625 perimenopausal women.

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Title

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Abstract

Objective: To estimate the prevalence of severe stress urinary incontinence among perimenopausal women and to examine potential obstetrical risk factors.

Design: Mail survey of female volunteers for epidemiological research.

Setting: Postal questionnaire on stress urinary incontinence (SUI).

Population: 3114 women aged 49 – 61 years who comprised the GAZEL cohort.

Main outcome measure: Prevalence of severe SUI defined by the response "often" or "all the time" to the question "Does urine leak when you are physically active, cough or sneeze?"

Methods: Logistic regression using data from the entire cohort to estimate the impact of risk factors. A second logistic regression using data from women who had given birth included obstetric history.

Results: 2625 women (85%) completed and returned the questionnaire The frequency of SUI reported in the preceding four weeks was: "never" 32%, "occasionally" 28%, "sometimes" 26%, "often" 10%, and "all the time" 5%. Prevalence of severe SUI was lowest among nulliparous women (7%), but it was similar among parous women regardless of birth number (14 – 17%). The prevalence of severe SUI was not associated with mode of delivery (14% for women delivered by caesarean only versus 16% for vaginal births). Significant risk factors for severe SUI were high body mass index (>30), diabetes mellitus, previous incontinence surgery, parity, and first delivery under the age of 22 years.

Conclusion: Pregnancy itself is a risk factor for severe SUI among women who reach the age of 50. In this age group the impact of the mode of delivery (spontaneous, forceps or caesarean) on severe SUI is slight.

Introduction

Stress urinary incontinence (SUI) is common in women, and the prevalence peaks at around the age of 50 years.[1, 2] The principal known risk factors are age, body mass index (BMI) and parity.[1-5] Several studies report that SUI occurs less often after caesarean than vaginal deliveries.[6-9] The medical community has begun discussing the possible benefits of elective Caesarean section to prevent future continence problems, and some obstetricians would choose caesarean over vaginal deliveries for themselves or their partners because of fear of SUI.[10]

The relation between SUI and pregnancy is complex. The interval between the first pregnancy and the onset of bothersome symptoms is quite long: the mean age of surgery at SUI is 54 years, and first childbirth in this age group dates back approximately 30 years.[11] It is therefore difficult to establish a firm link between an obstetrical event and the need for a surgical procedure for SUI many years later. Moreover, there is no proven causal link between the urinary problems of the early postnatal and those occurring around the menopause. Pregnancy related problems often disappear or regress after delivery. The long-term follow-up study by Viktrup showed that the prevalence of SUI was 32% during the first pregnancy, diminished postpartum to 6% at 3 months and increased again to 30% 5 years later.[12] It is also not proven that pregnancy/postpartum stress leakage and perimenopausal leakage share the same pathophysiology. Parity is a risk factor for SUI only among young women; the association is highest among those 20-34 years, and non-existent after 65 years.[3, 13] The effects of pregnancy and delivery on continence may therefore fade with time.

This study was conducted to estimate the prevalence of severe SUI around menopause and to assess the risk factors for this symptom with a questionnaire bases survey, including questions about obstetrical history.

Methods

Our population was selected from the French GAZEL cohort, which began in 1989 with 20 000 men and women employed by the French national power company (EDF-GDF) who volunteered to participate in epidemiological research.[14] Women of the GAZEL cohort aged 45-50 years between 1990 and 1996 (n = 3114) were included in a separate prospective survey, termed the "Women and their Health" project. The principal objective of this study is to examine women's health as they reach menopause and afterwards.[15] They receive a general health questionnaire each year as part of the overall GAZEL survey and a specific questionnaire about women's health issues every three years. For the study reported here an additional questionnaire about urinary symptoms and obstetrical history was mailed in 2000 to all the women in this survey. The study data were extracted from this questionnaire with social, demographic, life-style and health characteristic data obtained from previous questionnaires to compare respondents and non-respondents.

SUI was assessed by responses to the question "Does urine leak when you are physically active, cough or sneeze?" Possible responses were: "never", "occasionally", "sometimes", "often", or "all the time".[16] The question covered the previous four weeks. "Occasionally" was defined as less than one third of the time; "sometimes" as between one and two thirds of the time, and "often" as more than two thirds of the time. Women who answered "often" or "all the time" were considered to have severe SUI.

We tested the following potential risk factors: general characteristics (age at questionnaire, educational level, BMI, and menopausal status), medical history (diabetes mellitus, hysterectomy, surgery for incontinence or pelvic organ prolapse), life-style (income, marital status, smoking habits, regular physical exercise), and obstetrical history (parity, age at delivery, birth weight, mode of delivery). We first conducted a bivariate analysis between women with severe SUI and all other grades. Significant variables were included in a multivariate analysis with a stepwise logistic regression. Mode of delivery was forced into the model, and other variables were eligible for entry if

they had a *p* value < 0.05 in the bivariate analysis. We constructed a logistic regression model for the entire population and a second model only for parous women. We constructed two variants of the latter: in Model 2A we took into account the mode of first delivery (spontaneous, forceps or caesarean delivery). In model 2B the mode of all deliveries was considered (at least one vaginal delivery or caesarean section only). Because of the retrospective nature of the obstetrical questionnaire, we did not plan to distinguish elective and emergency caesareans. All analyses were performed with Statview (SAS Institute Inc. Cary, NC, USA).

The GAZEL cohort scientific committee and the French committee for health research data approved this study, which received no external funding.

Results

Of 3114 questionnaires sent out, 2625 (84%) usable copies were returned. Comparison between respondents and non-respondents showed no significant differences in age, BMI, parity, marital status, or smoking. On the other hand, respondents had a higher educational level (19% with high school diploma or more versus 14%; p=0.01, chi² test).

Tables 1 and 2 detail the population characteristics and obstetric history data for all women, and for those parous women respectively. Of the 163 women who gave birth to their first child by caesarean section, only 22 (13%) had a subsequent vaginal delivery. Of the 2098 women with initial vaginal deliveries, only 60 (3%) later had caesarean deliveries.

SUI frequency in the 4 weeks before response was reported as "never" by 829 (32%); "occasionally" by 724 (28%); "sometimes" by 686 (26%); "often" by 260 (10%), and "all the time" by 126 (5%) women, giving 386 women (15%) considered to have severe SUI. In this group, 206 (53%) considered SUI "a serious problem", 94 (24%) "quite a problem", 81 (21%) a "slight problem", and only 3 (1%) "not a problem". 186 women (46%) wore pads; 279 (72%) reported they wanted treatment; 241 (62%) had already discussed it with their physician, and 147 (38%) had already undergone an unsuccessful treatment. SUI severity increased with parity (Table 3) but was similar in women with vaginal or only caesarean deliveries (Table 4).

Results of the bivariate analysis are shown in Table 5, and the multivariate analyses in Table 6. Variables introduced in the first logistic regression, which considered the entire population, were BMI, history of diabetes, hysterectomy, incontinence or pelvic organ prolapse surgery, and parity. In this multivariate model, the risk of severe SUI increased with BMI, diabetes, and previous UI surgery (Table 6, Model 1). The risk of SUI was higher among parous than nulliparous women, but the differences between those with one, two, or more deliveries were not significant. Hysterectomy and previous pelvic organ prolapse surgery were not independently associated with severe SUI.

An additional logistic regression was undertaken for the parous women only (Table 6, Model 2A & B). It included BMI, diabetes, previous UI surgery, age at first delivery and mode of delivery. Multivariate analysis showed that neither mode of first delivery (Table 6, Model 2A) nor mode of all deliveries (Table 6, Model 2B) was associated with severe SUI in our population. An independent association was found among parous women with age at first delivery < 22 years, who had a higher risk of severe SUI.

Discussion

The prevalence of severe SUI in our population of perimenopausal women was 15%. Significant risk factors were BMI, diabetes, incontinence surgery, parity and youthful delivery (age less than 22 years). Our population differs slightly from the overall population of women employees at the power company, which in turn differs from the general French female population.[14] Nonetheless these differences concern variables (marital status, educational level) that are not associated with the risk of SUI. We therefore think that the risk factors identified here can be extrapolated to the general population.

Details of obstetrical history were collected retrospectively. No alternative was available because France has no national birth registry, and maternity unit records are destroyed after 20 years. Memory bias for obstetrical variables such as mode of delivery is nonetheless improbable. We did not plan to collect information concerning the type (elective or emergency) of caesarean because we presumed that this retrospective information would not be reliable. We note however that the women questioned had given birth for the first time 30 years earlier on average, at a time when elective caesareans, especially for a first delivery, were still relatively rare. In view of the low caesarean rate in this population (7%), it is probable that even if this information had been available, it would not have been significant.

We deliberately limited our definition of stress urinary incontinence to women reporting leaks "often" or "all the time" because our principal objective was to explore the effect of a caesarean on incontinence sufficiently severe to result in surgical treatment. In our survey more than half (53%) the women reporting severe SUI considered it a serious problem, almost three quarters (72%) wanted treatment, almost two thirds (62%) had already discussed it with their physician, and more than a third (38%) have already undergone unsuccessful treatment.

While postpartum studies have found that the prevalence of SUI is lower after caesarean delivery,[6, 7] we found no protective effect against SUI by caesarean section in our population. Even four years after the first delivery, SUI is reported to be less likely in women with caesarean deliveries (OR=0.3; 95% CI 0.1–0.9).[8] Only a few studies, however, have investigated the association between mode of delivery and SUI around menopause. The survey of Rortveit et al analysed the association between prevalence of SUI (pure or mixed) and mode of delivery (vaginal only versus caesarean section only) according to age group. SUI prevalence was higher among those aged 30-39 years who delivered vaginally (19%) compared with those delivered by caesarean (10%, OR=2.1, 95%CI: 1.45-3.13) but the difference was not significant among those aged 40-49 years (24% versus 18%) or 50-64 years (27% versus 20%).[9]. In the study by Kuh et al of 1333 women aged 48 years, SUI prevalence was slightly higher among women with only vaginal deliveries compared with women delivered only by caesarean section (52% versus 44%) but again the difference was not significant.[17] Several hypotheses may explain the discrepancies between these data and ours. Emergency caesarean section may not be protective for urinary continence. Accordingly a year after a first delivery Groutz et al found a prevalence of stress urinary incontinence of only 3% after elective caesarean compared with 12% after caesarean during labour and 10% after vaginal delivery.[18] Caesarean section during labour appears to carry a risk of nerve injury that elective caesarean section does not.[19, 20] The mobility of the bladder neck also seems higher after caesarean section during labour.[21] The protective effect of caesarean section that is observed postpartum and few years later may disappear with age and multiple pregnancies. We know that the association between SUI and parity reported before 35 years disappears after 65 years.[3, 13] In Wilson's work, the prevalence of postpartum urinary incontinence was similar in women giving birth for the third time or more by caesarean (39%) and in those giving birth for the third time or more vaginally (38%).[7] After several years the difference observed initially between vaginal delivery and caesarean section is no longer apparent. The protective effect of caesarean section

may also be so slight that it can be measured only in very large samples: in our population only 137 had only caesarean deliveries.

Conclusion

Pregnancy itself is a risk factor for severe SUI among women in their fifties. In this age group the impact of the mode of delivery (spontaneous, forceps or caesarean) on severe SUI is slight.

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Table 1. Population characteristics

Characteristics (n = 2625)		n (%)
Age at questionnaire	< 52	641 (24)
	52–57	1388 (53)
	≥ 58	596 (23)
High school diploma	No	2058 (78)
	Yes	505 (19)
Monthly income	< 1600 €	512 (20)
	1600-2592 €	1054 (40)
	≥ 2592 €	937 (36)
Marital status	Couple	1748 (67)
	Alone	598 (23)
Smoking	No	2284 (87)
	Yes	305 (12)
Regular physical exercise	No	1208 (46)
	Yes	1362 (52)
Body mass index (kg/m²)	< 25	1658 (63)
	25–30	660 (25)
	> 30	248 (9.4)
Menopausal status	Premenopausal	527 (20)
	Postmenopausal with HRT	1300 (50)
	Postmenopausal without HRT	784 (30)
Diabetes	No	2488 (95)
	Yes	71 (2.7)
Hysterectomy	No	2108 (80)
	Yes	460 (18)
UI surgery	No	2550 (97)
	Yes	69 (2.6)
Pelvic organ prolapse surgery	No	2491 (95)
	Yes	70 (2.7)
Parity	0	308 (12)
	1	769 (29)
	2	1203 (46)
	3+	345 (13)

Where percentages do not add to 100%, there were some missing data (0.2 – 11%).

Table 2. Obstetrical history of deliveries among parous women

Factor	Range	n (%)
Age at 1st delivery (years)	< 22	602 (26)
	22–26	1152 (50)
	≥ 27	559 (24))
1st birth weight (kg)	< 3.0	617 (27)
	3.0–4.0	1517 (65)
	> 4.0	129 (5.6)
Largest birthweight (kg)	< 3.0	364 (16)
	3.0–3.9	1671 (72)
	≥ 4.0	244 (11)
Mode of 1st delivery	Spontaneous	1760 (76)
	Forceps	382 (16)
	Caesarean	163 (7.0)
Mode of all deliveries	Vaginal, at least 1	2168 (94)
	Caesarean only	137 (5.9)

N=2317. Where percentages do not add to 100%, there were some missing data (0.2 – 2%).

Table 3. SUI severity according to parity.

SUI	Parity			
	0 n (%)	1 n (%)	2 n (%)	3+ n (%)
"never"	141 (46)	278 (36)	309 (26)	101 (29)
"occasionally"	83 (27)	205 (26)	351 (29)	85 (24)
"sometimes"	62 (20)	182 (24)	342 (28)	100 (29)
"often"	15 (4.8)	65 (8.4)	138 (11)	42 (12)
"all the time"	7 (2.3)	39 (5.0)	63 (5.2)	17 (4.9)

Chi² test, $p < 0.0001$. Data missing for 15 women (0.6%).

Table 4. SUI severity according to mode of deliveries.

SUI	Mode of all deliveries	
	Vaginal n (%)	Caesarean only n (%)
"never"	639 (29)	48 (35)
"occasionally"	592 (27)	43 (31)
"sometimes"	594 (27)	27 (20)
"often"	233 (11)	12 (8.8)
"all the time"	112 (5.1)	7 (5.1)

Chi² test, p = 0.39. Data missing for 25 women (1.1%).

Table 5. Association between women's characteristics and severe SUI: bivariate analysis.

Women's characteristics		Severe SUI prevalence %	Bivariate analysis OR (95%CI)
Age at questionnaire	< 52	13	1
	52–57	15	1.3 (1.0-1.6)
	≥ 58	15	1.3 (0.9-1.7)
High school diploma	No	15	1
	Yes	12	0.8 (0.4-1.7)
Monthly income	> 1600 €	14	1
	1600-2592 €	16	1.2 (0.7-1.4)
	≥ 2592 €	14	1.0 (0.7-1.4)
Marital status	Couple	14	1
	Alone	16	1.1 (0.7-1.4)
Smoking	No	15	1
	Yes	11	0.7 (0.5-1.1)
Regular physical exercise	No	16	1
	Yes	14	0.8 (0.7-1.0)
Body mass index (kg/m²)	< 25	12	1
	25–30	17	1.4 (1.1-1.8)
	> 30	28	2.8 (2.0-3.8)
Menopausal status	Premenopausal	15	1
	Post with HRT	15	1.0 (0.8-1.3)
	Post without HRT	13	0.8 (0.6-1.1)
Diabetes	No	14	1
	Yes	28	2.3 (1.4-4.0)
Hysterectomy	No	14	1
	Yes	18	1.4 (1.1-1.8)
UI surgery	No	14	1
	Yes	32	2.8 (1.7-4.7)
Pelvic organ prolapse surgery	No	14	1
	Yes	26	2.1 (1.2-3.6)
Parity	0	7.1	0.5 (0.3-0.8)
	1	14	1
	2	17	1.3 (1.0-1.7)
	3+	17	1.3 (0.9-1.9)
Age at 1st delivery (years)	< 22	20	1.5 (1.1-1.9)
	22–26	14	1
	≥ 27	14	1.0 (0.7-1.3)
1st birth weight (kg)	< 3.0	17	1
	3.0–3.9	16	0.9 (0.7-1.2)
	≥ 4.0	12	0.7 (0.4-1.2)
Heaviest birth weight (kg)	< 3.0	17	1
	3.0–3.9	16	0.9 (0.7-1.2)
	≥ 4.0	14	0.8 (0.5-1.3)

Mode of 1st delivery	Spontaneous	17	1
	Forceps	13	0.8 (0.5-1.0)
	Caesarean	13	0.8 (0.5-1.3)
Mode of all deliveries	Vaginal, at least 1	16	1
	Caesarean only	14	0.9 (0.5-1.4)

Analyses used logistic regression. Variables not significant (p > 0.05) during bivariate analysis were *not introduced* in multivariate analysis. Multivariate analysis of included variables is shown in Table 6.

Table 6. Association between women's characteristics and severe SUI: multivariate analysis.

Women's characteristics		Multivariate analysis		
		Model 1 OR (95%CI)	Model 2A OR (95%CI)	Model 2B OR (95%CI)
Body mass index (kg/m²)	< 25	1	1	1
	25–30	1.4 (1.1-1.8)	1.3 (1.0-1.7)	1.3 (1.0-1.7)
	> 30	2.6 (1.9-3.6)	2.5 (1.8-3.5)	2.5 (1.8-3.5)
Diabetes	No	1	1	1
	Yes	1.8 (1.0-3.2)	1.6 (0.9-2.8)	1.6 (0.9-2.9)
Hysterectomy	No	1	*not introduced*	*not introduced*
	Yes	1.1 (0.9-1.5)		
UI surgery	No	1	1	1
	Yes	2.1 (1.2-3.7)	2.3 (1.3-4.0)	2.3 (1.4-4.0)
Pelvic organ prolapse surgery	No	1	*not introduced*	*not introduced*
	Yes	1.5 (0.8-2.7)		
Parity	0	0.5 (0.3-0.8)	*not introduced*	*not introduced*
	1	1		
	2	1.2 (1.0-1.6)		
	3+	1.2 (0.8-1.7)		
Age at 1st delivery (years)	< 22	*not introduced*	1.4 (1.1-1.9)	1.4 (1.1-1.9)
	22–26		1	1
	≥ 27		1.0 (0.7-1.3)	1.0 (0.7-1.3)
Mode of 1st delivery	Spontaneous	*not introduced*	1	*not introduced*
	Forceps		0.8 (0.6-1.1)	
	Caesarean		0.8 (0.5-1.3)	
Mode of all deliveries	Vaginal, at least 1	*not introduced*	*not introduced*	1
	Caesarean only			0.8 (0.5-1.4)

Model 1 considered the entire population (n=2625). Model 2 considered only parous women (n=2317) with two variants: Model 2A considered mode of first delivery while Model 2B considered mode of all deliveries. Variables concerning deliveries were *not introduced* in Model 1 and variables without signification in Model 1 were *not introduced* in Model 2.