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ORIGINAL ARTICLE

Stress urinary incontinence 3 years after pregnancy: correlation to mode of delivery and parity

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Abstract The aim was to estimate the incidence of stress urinary incontinence 3 years after delivery and its correlation to mode of delivery and parity. A longitudinal cohort study was conducted with 120 women at the Antenatal Clinic at the State University of Campinas. There was a significant difference in the incidence of postpartum stress urinary incontinence (SUI) among patients with SUI during pregnancy ($p>0.0001$). Women that were asymptomatic during pregnancy and had vaginal delivery developed SUI 2.4 times more frequently than after c-section (19.2% and 8.0%, respectively). The incidence of SUI after delivery dropped significantly in the primiparous ($p=0.0073$) and multiparous 2–3 ($p<0.0001$), but not in the multiparous with four or more deliveries (66.7% to 60.0%) ($p=0.5637$). A significant correlation has been observed between parity and SUI ($p=0.0299$). Pregnancy possibly predisposes to SUI 3 years after delivery as well as parity. No significant correlation has been demonstrated between mode of delivery and SUI.

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Keywords Mode of delivery · Parity · Pregnancy · Stress urinary incontinence

Abbreviations

SUI	Stress urinary incontinence
LUTS	Low urinary tract symptoms
US	United States
ICS	International Continence Society
RR	Risk ratio

Introduction

Stress urinary incontinence (SUI) is a very frequent symptom of adult women, with devastating consequences on quality of life. Its prevalence is supposed to be underestimated, with incredibly differences among the literature caused by distinct definitions, quantifications, or even cultural issues. In a large epidemiological study, SUI was referred by 20.7% of the women, and was considered severe in 8.7% of the cases [1]. In Brazil, a survey in the area of Campinas, SP, identified that 35% of the women aged between 45 and 60 years old, were referred to the SUI [2]. In the same year, according to the Brazilian Demographic Survey [3], 11 million women were in this age group, leading to the conclusion that 3.8 million suffered with SUI symptoms.

The natural history of SUI is not well known and spontaneous remission may occur in up to 30% of the

Table 1 Incidence of SUI according to clinical characteristics

	SUI after delivery		*P* value	RR (CI 95%)
	Number (*n*)	Percent		
Age			0.4342	
20–30	(73) 21	28.8		1.00
31–40	(39) 12	30.8		1.07 [0.59–1.94]
41–50	(8) 4	50.0		1.74 [0.80–3.80]
BMI			0.3279	
<30	(80) 27	34.0		1.00
≥30	(40) 10	25.0		1.35 [0.73–2.51]
Newborn weight			0.2002	
<4000	(113) 33	29.0		1.00
≥4000	(7) 4	57.0		0.51 [0.25–1.03]
Episiotomy			0.2905	
Yes	(49) 15	31.0		0.69
No	(18) 8	44.0		1.00 [0.35–1.34]
Race			0.8664	
White	(63) 19	30.2		0.96
Non White	(57) 18	31.6		1.00 [0.56–1.63]

Qui-square analysis

cases. Although more common in women after at least one delivery, 3% to 15% of nulliparous women refer SUI [4]. When present before the first pregnancy, there is a higher risk of the symptom to occur during pregnancy, after delivery and later in life [5, 6]. Low urinary tract symptoms (LUTS) are common during pregnancy, and SUI was reported by 42% of pregnant women beyond 36 weeks gestation [7, 8] and by 45.4% of nulliparous beyond 26 weeks gestation [9]. Although the prevalence of the symptom diminishes after delivery, pregnancy definitely enhances the risk for future SUI symptoms.

The extent to which mode of delivery and parity influences LUTS in the future is controversial. The EPINCONT study, enrolling 15.307 women, demonstrated that SUI symptoms are more frequent after vaginal delivery than after c-section [1], and similar results were reported by other authors [10–12]. When c-section is indicated after labor has started, damage to the pelvic floor might not be avoided [13], although studies were not able to demonstrate differences in SUI prevalence among patients submitted to elective c-section [1, 14]. Parity represents a risk factor, particularly in women with three or more deliveries [14, 15]. Vaginal trauma determined by forceps or episiotomy may enhance the deleterious effects of the vaginal delivery [16, 17] and in the US, between 1999 and 2002, a reduction in 56% of episiotomies was observed [18].

The aim of our study was to determine SUI incidence 3 years after delivery and its correlation to mode of delivery and parity.

Patients and methods

This was cohort prospective study, and all participating patients gave informed consent before study entry. In a previous study, 340 pregnant women beyond 26 weeks gestation were interviewed and responded to a questionnaire about LUTS [9]. Three years after, the authors were able to interview 120 patients by telephone. Women that were pregnant at the moment of the interview or those who have had another pregnancy between the two interviews were excluded. Each woman answered a structured questionnaire, and data was recorded.

Stress urinary incontinence was defined according to the ICS standardization [19]. Mode of delivery included vaginal and c-section, and patients were asked about forceps use or episiotomy. According to parity, patients were classified as primiparous, multiparous 2–3, or multiparous 4 or more. The correlation of SUI 3 years after delivery and body mass index (BMI) during pregnancy, newborn weight, episiotomy, and race were considered.

The comparison of SUI frequency during pregnancy and 3 years after delivery was assessed by McNemar qui-square test, and the association between SUI incidence, mode of delivery and parity by the Fisher's exact test and measured by risk ratio (RR). $P<0.05$ was considered statistically significant.

Results

Of the 120 women interviewed 3 years after delivery, 63 (52.5%) referred themselves as white, 10.9% as black and 36.6% as mulatto. Overall, 69 (43.5%) reported stress urinary incontinence during the last pregnancy. The mode of delivery was exclusively vaginal or exclusively c-section

Table 2 Incidence of SUI after delivery according to SUI symptoms during pregnancy (n=37)

	SUI during pregnancy Number (*N*)	SUI after delivery Percent	*p* value
Yes (69)	30	43.5	<0.0001
No (51)	7	13.7	

Mc Nemar qui-square test

Table 3 Relationship between SUI 3 years after delivery and mode of delivery (n=95)

Mode of delivery	SUI after delivery				p value	RR (CI 95%)
	Yes		No			
	Number (n)	Percent	Number (n)	Percent		
Vaginal	17	32.1	36	67.9	0.1521	2.01 (0.77–5.23)
C-section	8	19.0	34	81.0		1.00

Qui-square test

in 44.2% and 35.0% of cases, respectively. Forty-five (37.5%) were primiparous and 75 (62.5%) multiparous. The mean age of the patients was 29±6.0 years. No statistical difference occurred between the incidence of SUI 3 years after delivery and body mass index (BMI) during pregnancy (p=0.3279), newborn weight (p=0.2002), episiotomy (p=0.2905), or race (p=0.8664) (Table 1). Women with SUI during pregnancy had a significantly higher incidence of SUI 3 years after delivery (p<0.0001), when compared to women who where asymptomatic during pregnancy (Table 2). Ninety-five of the 120 women had delivered exclusively by the vaginal route or by c-section. No significant correlation was observed between SUI incidence and mode of delivery. However, 32% of the women who delivered vaginally were referred SUI, while only 19% on the c-section group complained of the symptom (Table 3).

When the presence of SUI during pregnancy and mode of delivery were considered together, no statistic correlation was observed, although women that were asymptomatic during pregnancy and had vaginal delivery developed SUI 2.4 times more frequently than after c-section (19.2% and 8.0%, respectively) (Table 4).

The analysis of parity demonstrated that in women with four or more deliveries, the risk of developing SUI was 60%, approximately twice the risk obtained for nulliparous women or those with two to three deliveries. This difference was statistically significant (p=0.0299; Table 5).

Table 6 demonstrates the correlation of SUI during pregnancy and 3 years after delivery according to parity. While primiparous and multiparous with two to three deliveries have a significant fall in the incidence of SUI after delivery (p=0.0073 and p<0.0001 respectively), multiparous women with four or more deliveries did not present an important drop in SUI frequency (p=0.5637). Of the 37 women with SUI symptoms after delivery, 34 (91.9%) referred to social or hygienical discomfort.

Discussion

One interesting cultural aspect of Brazil and many Latin American countries is the liberal indication of c-section as a mode to avoid damage of the pelvic floor. In this study, c-section was the mode of delivery in 44.2% of women although a drop in c-section rates from 32.4% in 1995 to 26.4% in 2003 was reported by Health Department in Brazil. Those numbers are still high when compared to US statistics of 9.0% to 16.0% of c-section [12, 20, 21].

At that moment, gynecologists must be aware of the alarming number of surgeries for the correction of genital prolapse and incontinence, both urinary and fecal. It is

Table 4 Relationship between SUI 3 years after delivery, SUI during pregnancy, and mode of delivery (n=120)

SUI during pregnancy	Mode of delivery	SUI after delivery				p value	RR (CI 95%)
		Yes		No			
		Number (n)	Percent	Number (n)	Percent		
Yes						0.9315	1.02
	Vaginal	18	43.9	23	56.1		[0.59–1.78]
	C-section	12	42.9	16	57.1		
No						0.4189[a]	2.40
	Vaginal	5	19.2	21	80.8		[0.51–11.27]
	C-section	2	8.0	23	92.0		

Qui-square test
[a] Fisher's exact test

Table 5 Relationship between SUI 3 years after delivery and parity (n=120)

Parity	SUI after delivery				p value	RR (CI 95%)
	Yes		No			
	Number (N)	Percent	Number (n)	Percent		
Primiparous	11	24.4	34	75.6	0.0299	1.00
Multiparous 2–3	17	28.3	43	71.7		1.24 [0.64–2.38]
Multiparous ≥4	9	60.0	6	40.0		2.62 [1.35–5.08]

Qui-square test

estimated that 11% of women, along their lives, will be submitted to surgery because of pelvic floor trauma followed by dysfunction [22]. Uma et al. [23] studied the influence of intrapartum care during a first delivery on the risk of pelvic floor surgery in later life in 7,556 primiparous women and concluded that c-section significantly reduces the risk when compared to spontaneous vaginal delivery. According to Davila [24], elective c-section may reduce this damage, and patients should be advised during pregnancy of the risks of vaginal delivery.

In the literature, recent studies involving large populations have shown the protective effect of c-section on the pelvic floor [1, 11, 16]. Our study could not demonstrate a significant correlation between mode of delivery and SUI. Nevertheless, the incidence of SUI 3 years after vaginal delivery was two times more frequent than after c-section. In our Hospital, c-section is seldom elective, usually being preceded by a long and dysfunctional labor, a well-known reason to worsen outcome [13, 25]. A limitation of this study is attributed to the migratory characteristics of our population, leading many patients to have their deliveries at different hospitals and with different physicians. For this reason, important issues as indication of cesarean section or the length of labor could not be analyzed.

Table 6 Relationship between SUI during pregnancy and 3 years after delivery according to parity (n=120)

Parity	SUI after delivery		p value
	Prevalence during pregnancy	Incidence after delivery	
Primiparous	51.1	24.4	0.0073
Multiparous 2–3	60.0	28.3	<0.0001
Multiparous ≥4	66.7	60.0	0.5637

Mc Nemar's qui-square test

The correlation between parity and SUI seems less controversial [14, 21], and we observed that SUI was significantly more common after the third delivery. Besides, while a significant decrease in SUI symptoms occurs in primiparous and multiparous women with up to three deliveries (51.1% to 24.4% and 60.0% to 28.3%, respectively), four or more deliveries appears to definitively enhance the risk for SUI in adult life. It is possible that the combined influence of multiple pregnancies and deliveries contribute to these findings.

Although other studies could demonstrate that the prevalence of incontinence increased with increasing body-mass index [1], in this study, this correlation was not observed. Birth weight over 4,000 g is rare among our population (5.8%) and was also not related to SUI after delivery. The mulatto, representing 44% of the Brazilian population, expresses a multiracial rather than a biracial society and makes it difficult to analyze race as an individual risk factor for any condition.

In a previous study with the same population [9], patients referred that urinary symptoms compromised their quality of life during pregnancy in 47.7% of the interviewed. Three years after, we could identify 91.9% of the women referring discomfort or constraint because of SUI symptoms. It is unacceptable that millions of women consider fecal or urinary incontinence, sexual dysfunction and genital prolapse as part of normal life and aging. Simple attitudes, as pelvic floor muscle training programs during pregnancy and after birth, could contribute to efficiently prevent SUI later in life, being implemented by public health services.

Conflicts of interest None.

Appendix 1

Questionnnaire 2: SUI three years after delivery

Questionnaire N° [ ] [ ] [ ] HC: [ ] [ ] [ ] [ ] [ ] [ ] – [ ] [ ]

Date ...../...../.....

Patient's data

Name:..... Age: ..... years old

Phone:.....

Section 1

Obstetric data (2003 – 2004)

1. Date ...../...../.....

2. Mode of delivery [1] vaginal [2] forceps [3] elective c-section [4] non-elective c-section

4. Did you realize episiotomy? [1] Yes [2] No

5. Newborn weight [1] < 4,000 g [2] ≥ 4,000 g 5.A [ ], [ ] [ ] [ ] g

Urogynecological anamneses after delivery

6. SUI

[1] maintained [2] improved [3] worsen [4] still not present [5] started after delivery [6] cured

7. SUI on effort [1] cough [2] sneeze [3] laugh [4] lift heavy objects [5] others

8. SUI frequency [1] once a week [2] many times a week [3] daily

9. SUI intensity [1] mild [2] moderate [3] severe

10. Cure occurred [1] immediately after delivery [2] up to 3 months after delivery [3] more than 3 months after delivery

Section II

11. Did you realize any kind of treatment for SUI?

[1] surgical [2] physiotherapy [3] drugs [4] none

12. If you did realize any treatment, what was the result? [1] improvement [2] worsen [3] maintained

13.Do you feel any social or hygienic problem related to SUI)?

[1] Yes [2] No

QUESTIONNAIRE 1

Date...../...../.....

N° of questionnaire: [ ] [ ] [ ]

Identification

Name: .....

Address:..... .....

City: ..... State: ..... Zip Code .....

Phone (.....).....

HC: [ ] [ ] [ ] [ ] [ ] [ ] – [ ]

Section 1 Characterisitcs of the patient

1. How old are you? ..... years
2. Are you: single, married, divorced, widow?
   [1] Single [2] Married [3] Divorced [4] Widow
3. School degree?
   [1] None [2] Elementary school [3] Middle school
   [4] High school [5] College
4. Are you?
   [1] White [2] *Mullata* [3] Black [4] Asian [5] Indian
5. Weight = ... kg
6. High = ... cm
7. BMI = ...

Section 2 Obstetric data

8. Number of pregnancies? [ ] [ ] times
9. Have you ever had na abortion?(1) Yes
   (2) No
10. Number of deliveries? [ ] [ ]

11. Deliveries characteristics:

Delivery	Mode of delivery 1 = Vaginal, 2 = Forceps, 3 = C-section, 4 = elective c-section	Newborn weight (gr)
11.1- 1°		
11.2- 2°		
11.3- 3°		
11.3- 4°		

Section III – Urogynecological symptoms

12. Do you lose urine on effort (SUI)? [1] Yes [2] No
13. When do you lose urine?

Problem	Do you lose urine? 1 = Yes e 0 = No If Yes, in which circunstance	Moment 1 = before pregnancy, 2 = during pregnancy
3.1- Cough		
13.2- Sneeze		
13.3- Laugh		
13.4-Change position		
13.5- Carry heavy objects		
13.6- Other efforts		

14. How many times a week do you lose urine?

    [1] Once a week [2] Many times a week [3] Daily
15. The amount of urine you lose is:

    [1] Small [2] Moderate [3] Too much
16. Do you lose urine during intercourse? [1] Yes [2] No
17. Do you feel any discomfort by loosing urine? [1] Yes [2] No
18. Does you Mother have or have had SUI? [1] Yes [2] No [3] Do not know

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