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Relationship between Female Urinary Incontinence and Mode of Delivery

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Abstract

To retrospectively assess the relationship between female stress urinary incontinence (SUI) and mode of delivery and to evaluate whether vaginal delivery increases the risk of subsequent urinary incontinence or not. It was a case-series study that was done at Ain Shams University Maternity Hospital and included women who were admitted to Ain Shams University Maternity Hospital, for having stress urinary incontinence, over a 5-year period, between January 2005 and December 2009. A second group of matched women, with no complaint of SUI and came to outpatient clinic for reasons other than urinary incontinence, were included as a control group. Data was collected from patient records available at "Patient Records Department" at Ain-Shams University Maternity Hospital. Missing data was collected through phone calls or direct contact with the patients or their relatives. This study included 2 groups of women: group I (study group) [n=80]: women who were admitted for having a complaint of SUI, and group II (control group) [n=80]: women with no complaint of SUI and came to outpatient clinic for reasons other than urinary incontinence. There was a significantly higher proportion of vaginal deliveries and a significantly lower proportion of Cesarean sections among women who had stress urinary incontinence, when compared to women of the control group [66/80 (82.5%) vs. 41/80 (51.3%) and 14/80 (17.5%) vs. 39/80 (48.7%), respectively, p<0.001]. The prevalence of operative vaginal delivery was significantly higher among women who had stress urinary incontinence when compared to women of the control group [9/66 (13.6%) vs. 0/41 (0%),

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respectively, p=0.04]. The prevalence of urgent Cesarean sections was significantly higher among women who had stress urinary incontinence when compared to women of the control group [8/14 (57.1%) vs. 1/39 (2.6%), respectively, p=0.03] Of the included 80 women who had stress urinary incontinence, 47 (58.7%) women had stress urodynamic type, 6 (7.5%) had detrusor instability, while 27 (33.8%) had mixed type of stress urinary incontinence. There was a significantly higher proportion of vaginal deliveries among women who had stress urodynamic or mixed type of urinary incontinence, when compared to women who had detrusor instability [41/47 (87.2%) vs. 22/27 (81.5%) vs. 3/6 (50%), respectively, p=0.001] There was a significantly higher proportion of women who had operative vaginal delivery among women who had urodynamic stress urinary incontinence, when compared to women who had detrusor instability or mixed type [9/41 (21.9%) vs. 0/3 (0%) vs. 0/22 (0%), respectively, p=0.04] There were significant positive correlations between stress urinary incontinence and vaginal delivery [r= 0.297, p<0.001].

Keywords

Stress urinary incontinence – mode of delivery

I. Introduction

Urinary incontinence is defined by the International Continence Society (ICS) as the complaint of any involuntary leakage of urine [1]. Female urinary incontinence comprises a significant health and social problem. It affects between 5% and 30% of women, depending on age and a variety of social risk factors [2]. Stress urinary incontinence (SUI) is the most common form of urinary incontinence in women and is particularly common in younger women. SUI occurs during periods of increased intra–abdominal pressure (e.g., sneezing, coughing, or exercise) when the intravesical pressure rises higher than the pressure that the urethral closure mechanism can withstand [3]. Although SUI is the most common type of urinary incontinence in women, urge incontinence (UUI) is the most common form of incontinence in older women. UUI is the involuntary leakage of urine accompanied by or immediately preceded by urgency. This is a symptom–based diagnosis and may or may not be caused by detrusor overactivity, which is a urodynamic observation characterized by involuntary detrusor contractions during the filling phase. Women may also have related problems such as urgency, nocturia, and increased daytime frequency [4]. Women with mixed incontinence have symptoms of both stress and urge urinary incontinence. Younger women are more likely to have stress incontinence alone, whereas in older women mixed and urge incontinence predominate. In a review of 15 population–based studies of women of all ages with urinary incontinence, a median of 49% (range 24%–75%) had SUI, 21% (range 7%–49%) had UUI, and 29% (range 11%–61%) had mixed urinary incontinence [5]. Evidence suggests that Cesarean section (CS) can protect women

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against urinary incontinence. The Royal College of Obstetricians and Gynecologists (RCOG) stated in their National Evidence-Based Guidelines for CS that women who deliver vaginally has an absolute risk of subsequently developing SUI of 7.3%, compared with 4.5% in women who deliver by CS; and that the relative risk (CS vs. vaginal delivery) is 0.6 [95% CI (0.4 to 0.9)] which is statistically significant [6]. Nevertheless, many studies were inconclusive and even showed no difference concerning mode of delivery in subsequent risk of developing urinary incontinence [7,8,9]. Therefore, there is a need to have our own assessment of the relationship between the mode of delivery and subsequent SUI in Egyptian women who present to Ain Shams University Maternity Hospital.

II. Methods

This was a case-series study that was done at Ain Shams University Maternity Hospital and included women who were admitted to Ain Shams University Maternity Hospital, for having stress urinary incontinence, over a 5-year period, between January 2005 and December 2009. A second group of matched women, with no complaint of SUI and came to outpatient clinic for reasons other than urinary incontinence, were included as a control group.

Inclusion criteria:

1. Age: 18-40 years, premenopausal state
2. Significant complaint of stress urinary incontinence affecting general hygiene of the patient and socially unacceptable, which necessitated evaluation by urodynamics, and was proven to have either urodynamic stress incontinence, overactive bladder or mixed form of urinary incontinence.

Exclusion criteria:

1. Postmenopausal women.
2. Chronic systemic disease causing overactive bladder e.g. diabetes mellitus.
3. Chronic obstructive airway disease e.g. bronchial asthma or emphysema.
4. Past history of pelvic surgery other than cesarean section.
5. Use of drugs that may affect bladder function and urinary tract.
6. History of urinary incontinence prior to delivery.

Data was collected from patient records available at "Patient Records Department" at Ain-Shams University Maternity Hospital. Missing data was collected through phone calls or direct contact with the patients or their relatives. All included women were subjected to revising history and examination sheets with particular emphasis on personal history: age, residence, education level and socioeconomic status, Complaint regarding SUI, obstetric history including parity and gravidity and mode of delivery. Elective CS was a planned section in which the decision was taken with sufficient time before delivery such as placenta previa, conjoined twins. Emergency CS was that required immediate intervention within 30 minutes from time of decision until the procedure is begun such as cord prolapse, symptomatic uterine rupture and certain cases of obvious & symptomatic placental abruption and persistent hemorrhage secondary to placenta previa. Urgent CS was that in which rapid intervention was required but was not necessary within the 30-minutes frame such as

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slow cervical dilation and slow fetal head descend. For all included women, the following investigations were retrieved: simple urinalysis, urine culture, and urodynamic assessment.

Statistical analysis: Retrieved data were recorded on an investigative report form. The data were analyzed with SPSS® for Windows®, version 15.0 (SPSS, Inc, USA). Description of quantitative (numerical) variables was performed in form of mean, standard deviation (SD) and range. Description of qualitative (categorical) data was performed in the form of numbers and percent. Analysis of numerical variables was performed by using student's unpaired t-test (for two groups) or ANOVA (for more than two groups). Analysis of categorical data was performed by using Fischer's exact test and Chi-squared test. Logistic regression analysis was performed to calculate association between variables and their odds ratios. Association between variables was estimated using Pearson's correlation coefficient (for parametric variables) and Spearman's correlation coefficient (for non-parametric variables). Significance level was set at 0.05.

III. Results

The current study was conducted on women admitted at Ain Shams University Maternity Hospital during the period between January 2005 and December 2009. The study included 2 groups of women: group I (study group) [n=80]; women who were admitted for having a complaint of SUI, and group II (control group) [n=80]; women with no complaint of SUI and came to outpatient clinic for reasons other than urinary incontinence. There was no significant difference between the two groups concerning age [33.48 ± 5.03 vs 31.6 ± 5.7] (table 1). The mean gravidity and parity showed no significant difference in women who had SUI when compared to women of the control group [3±1.09 vs 3±1.06 and 2±0.9 vs 2±1.5 respectively] (table 1).

Of the included 160 women, 107 (66.9%) delivered vaginally, while 53 (33.1%) delivered by CS (table-2). Of the 107 women who delivered vaginally, 98 (91.6%) delivered spontaneously, while 9 (8.4%) delivered by instrumental vaginal delivery (forceps-assisted). Of the 53 women who delivered by Cesarean section, 44 (83%) were elective, while 9 (17%) were urgent CS. There was a significantly higher proportion of vaginal deliveries and a significantly lower proportion of CS among women who had SUI, when compared to women of the control group [66/80 (82.5%) vs. 41/80 (51.3%) and 14/80 (17.5%) vs. 39/80 (48.7%), respectively, $p<0.001$] (table-2, figure-1).

Prevalence of operative vaginal delivery was significantly higher among women who had SUI when compared to the control group [9/66 (13.6%) vs. 0/41 (0%), respectively, $p=0.04$] and the prevalence of urgent Cesarean sections was significantly higher among women who had SUI when compared to women of the control group [8/14 (57.1%) vs. 1/39 (2.6%), respectively, $p=0.03$] (table-3).

Of the included 80 women who had SUI, 47 (58.7%) women had urodynamic SUI, 6 (7.5%) had detrusor instability, while 27 (33.8%) had mixed type of stress urinary incontinence. There was a significantly higher proportion of

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vaginal deliveries among women who had urodynamic SUI or mixed type, when compared to women who had detrusor instability [41/47 (87.2%) vs. 22/27 (81.5%) vs. 3/6 (50%), respectively, p=0.001] (table-4).

There was a significantly higher proportion of women who had operative vaginal delivery among women who had urodynamic SUI, when compared to women who had detrusor instability or mixed type [9/41 (21.9%) vs. 0/3 (0%) vs. 0/22 (0%), respectively, p=0.04] (table-5).

There were significant positive correlations between SUI and vaginal delivery [r= 0.297, p<0.001]. There was a non-significant poor correlation between SUI and gravidity [r=0.148, p> 0.05], parity [r=0.137, p> 0.05] and age [r = 0.137, p>0.05] (table-6).
Table-7 shows results of binary logistic regression analysis of the association between mode of delivery, gravidity and parity, and SUI. Vaginal delivery was associated with nearly 4-times higher risk of SUI than CS [odds ratio = 0.386, 95% CI (1.87 to 7.79)]. Gravidity & parity ≥ 4 were not associated with higher risk of SUI [odds ratio = 0.7 & 0.5, 95% CI (0.33 to 1.5) & (0.1 to 2.7) respectively].

IV. Discussion

The current study was conducted to retrospectively explore the relationship between mode of delivery and subsequent development of stress urinary incontinence (SUI) at a tertiary maternity hospital, Ain Shams University Maternity Hospital, during the period between January 2005 and December 2009. The study included 80 women admitted for having a complaint of SUI as a study group, and second group of another 80 women selected from matched women with no complaint of SUI recruited from the outpatient clinic as a control group. The mean age was 31.94 ± 5.44 years (range: 18 – 45 years). The mean gravidity and parity showed non-significant differences in women who had stress urinary incontinence when compared to women of the control group [3 ± 1.09 vs 3 ± 1.06 and 2 ± 0.9 vs 2 ± 1.5 respectively]. Of the included 160 women, 107 (66.9%) delivered vaginally, while 53 (33.1%) delivered by Cesarean section. There was a significantly higher proportion of vaginal deliveries and a significantly lower proportion of Cesarean sections among women who had stress urinary incontinence, when compared to women of the control group [66/80 (82.5%) vs. 41/80 (51.3%) and 14/80 (17.5%) vs. 39/80 (48.7%) respectively, p<0.001]. The prevalence of operative vaginal delivery was significantly higher among women who had stress urinary incontinence when compared to women of the control group [9/66 (13.6%) vs. 0/41 (0%), respectively, p=0.04]. The prevalence of urgent cesarean sections was significantly higher among women who had stress urinary incontinence when compared to women of the control group [8/14 (57.1%) vs. 1/39 (2.6%), respectively, p=0.03]. There was a significantly higher proportion of vaginal deliveries among women who had urodynamic or mixed type of stress urinary incontinence, when compared to women who had detrusor instability [41/47 (87.2%) vs. 22/27 (81.5%) vs. 3/6 (50%), respectively, p=0.001]. There was a significantly higher proportion of women who had operative vaginal delivery among women who had urodynamic stress urinary incontinence, when compared to women who had detrusor instability or mixed type [9/41 (21.9%) vs. 0/3 (0%) vs. 0/22 (0%),

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respectively, p=0.04]. The current study showed that vaginal delivery was associated with nearly 4-times higher risk of SUI than CS [odds ratio = 0.386, 95% CI (1.87 to 7.79)]. Gravidity was not associated with higher risk of SUI [odds ratio = 0.7, 95% CI (0.33 to 1.5)]. Also Parity was not associated with nearly higher risk of SUI [odds ratio = 0.5. 95% CI (0.1 to 2.7)].

In a retrospective study [2] conducted on 250 women (125 with SUI and 125 controls), increased age, body mass index, gravidity and parity as well as vaginal delivery were associated with SUI. They also showed that presence of vaginal prolapse and chronic constipation increases this risk. They concluded that CS may decrease the rate of SUI. The protective role of CS regarding subsequent development of SUI have also been shown by many previous studies [6,8,10]. Vaginal delivery may cause damage to the pelvic floor by either denervation of the pelvic floor or direct injury to the muscles and connective tissue [8]. Peschers [10] demonstrated that pelvic floor muscle strength was significantly reduced shortly after vaginal birth (3-8 days postpartum), but not following elective CS. They showed, however, that most women recovered within 2 months after delivery. Similarly, it was found that vaginal delivery was an independent risk factor associated with significant long term increase of SUI7,[11]. Also, it was reported that vaginal delivery is a major risk factor associated with SUI among multiparous and that CS has an independent protective effect [12].

On the contrary, in another study conducted by Vikki et al [9], the authors failed to show the protective role of CS and concluded that CS did not decrease the risk of urinary and fecal incontinence compared with vaginal delivery. They stated that pregnancy itself can increase the risk of urinary and fecal incontinence. But as the vast majority of studies assessing the relationship between the mode of delivery and SUI showed the protective role of CS, so this is actually the trend of evidence that invalidate their conclusion.

The impact of increasing age on the risk of development of SUI, though shown by many previous studies [2], was not shown by the results of the current study. One explanation is the relatively wide range of age of women included in the current study, making their distribution non-parametric. This non-parametric distribution may miss presence of significant association with stress urinary incontinence, when it may actually exist. Another explanation is the early age of marriage in the Egyptian population, making higher parities associated with relatively lower maternal ages, when compared to studies on different populations.

In the current study, there is no association between SUI and both gravidity and parity; however, this association has been shown by previous studies. In another cohort study [13] on 2390 women, demonstrated that the risk of SUI 1 year postpartum among primiparous women was 19% following a planned vaginal birth and 0% following elective CS. Among multiparous women, the prevalence was 25% following planned vaginal birth vs 13% following elective CS.

SUI was also shown to be significantly associated with operative vaginal delivery. The effect of instrumental vaginal delivery was investigated in 169 women and found significant increase in organ mobility with valsalva particularly after forceps delivery [14]. It was reported that forceps use during delivery contribute to weaker pelvic floor muscles post-

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delivery over women who deliver spontaneously and women who deliver spontaneously have weaker pelvic floor muscles post-delivery than women who undergo Cesarean section [15]. Furthermore, Hayman [16] documented that difficult instrumental delivery may be associated with shoulder dystocia after birth of fetal head, which has its own potentially negative impaction on pelvic floor and urinary structures. On the contrary, in other studies, it was found no increased risk with forceps delivery [7].

Elective, rather than urgent CS, was associated with a lower risk of SUI. This conclusion was supported by the results of a cohort study conducted on 12679 women [17]. Other studies showed that primary Cesarean section performed in the second stage of labor increases the risk of SUI, overactive bladder and anal incontinence more than CS performed prior to first stage of labor [15, 18]. It was reported that elective CS have prone to be protective of pudendal nerve damage, however, it is not entirely protective against pelvic floor damage or SUI [19].

According to results of this study, the protective effect of CS appears to be more relevant to SUI and mixed UI than urge UI. A population-based study demonstrated differences following vaginal delivery or cesarean of 15% vs 11% for SUI, 23% vs 16% for mixed UI, and 5.4% vs 3.7% for urge UI20. In a large cross-sectional study, the potential difference in symptoms was more significant with respect to SUI (14.7% after vaginal birth vs 7% after CS) than with urge UI (1.8% after vaginal birth vs 2.2% after CS) or mixed UI (6.8% after vaginal birth vs 5.5% after CS) [21].

V. Conclusion

There was a significantly higher proportion of women who had operative vaginal delivery among women who had urodynamic stress urinary incontinence, when compared to women who had detrusor instability or mixed type. According to results of this study, the protective effect of CS appears to be more relevant to SUI and mixed UI than urge UI. Increased parity and gravidity or lower educational level seem to be non-significant risk factors associated with subsequent development of stress urinary incontinence.

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Table (1): The demographic differences between Study and Control Groups.

	Group I [Study Group] (n=80)	**Group II [Control Group] (n=80)**	***P***
Age (Years)			
Range:	24 – 40	18 – 45	>0.05*
Mean ± SD:	33.48 ± 5.03	31.6 ± 5.7	NS
Gravidity			
Range:	1 – 6	1 – 6	>0.05*
Mean ± SD:	3 ± 1.09	3 ± 1.06	NS
Parity			
Range:	1 – 5	1 – 4	>0.05*
Mean ± SD:	2 ± 0.9	2 ± 1.5	NS

* Analysis using independent student's t-test. NS = non-significant

Table (2): Difference between Study and Control Groups concerning Mode of Delivery

	Group I [Study Group] (n=80)	**Group II [Control Group] (n=80)**	***P***
Mode of Delivery [No. (%)]:			
Vaginal Delivery:	66 (82.5%)	41 (51.3%)	<0.001*
Cesarean Delivery:	14 (17.5%)	39 (48.7%)	HS

* Analysis using Fischer's Exact test. HS = highly significant

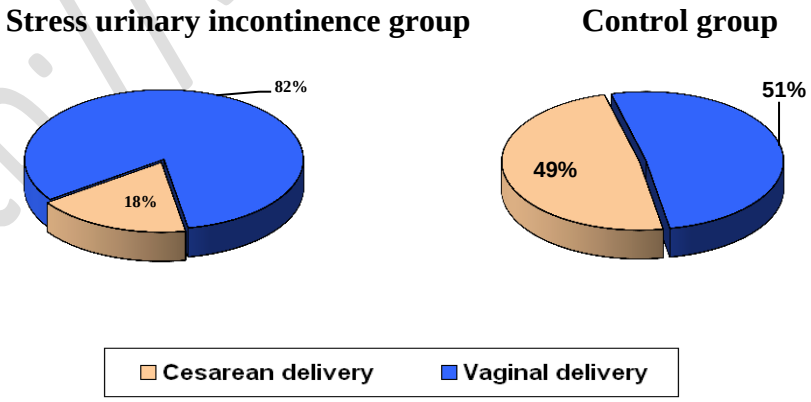

Figure (1): Pie Chart Difference between Study and Control Groups concerning Mode of Delivery

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Table (3): Difference between Study and Control Groups concerning Mode of Delivery

	G I [Study Group]	**G II [Control Group]**	***P***
Vaginal Delivery [No. (%)]:			
• **Spontaneous vaginal delivery:**	57/66 (86.4%)	41/41 (100%)	0.04* S
• **Operative vaginal delivery:**	9/66 (13.6%)	0/41 (0%)	
Cesarean Delivery [No. (%)]			
• **Elective Cesarean delivery:**	6/14 (42.9%)	38/39 (97.4%)	0.03* S
• **Urgent Cesarean delivery**	8/14 (57.1%)	1/39 (2.6%)	

* Analysis using Chi-squared test. S = Significant

Table (4): Difference between Different Types of SUI concerning Mode of Delivery

	Urodynamic SUI (n=47)	**Detrusor Instability (n=6)**	**Mixed SUI (n=27)**	***P***
Mode of Delivery [No. %)]:				
Vaginal Delivery:	41 (87.2%)	3 (50%)	22 (81.5%)	0.001* S
Cesarean Delivery:	6 (12.8%)	3 (50%)	5 (18.5%)	

* Analysis using Chi-squared test. S = Significant

Table (5): Difference between Types of SUI concerning Mode of Vaginal Delivery

Women who Delivered Vaginally	**Urodynamic SUI (n=41)**	**Detrusor Instability (n=3)**	**Mixed Type of SUI (n=22)**	***P***
Vaginal Delivery [No. (%)]:				
Spontaneous vaginal delivery:	32 (78.1%)	3 (100%)	22 (100%)	0.04* S
Operative vaginal delivery:	9 (21.9%)	0 (0%)	0 (0%)	

* Analysis using Chi-squared test. S = Significant

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Table (6): Correlation between SUI and Other Measured Variables

		SUI			SUI
Age	***r****	0.137	**Parity**	***r****	0.137
	p	>0.05		***p***	0.05
		NS			NS
Gravidity	***r****	0.148	**Vaginal Delivery**	***r****	0.297
	p	0.05		***p***	<0.001
		NS			HS

* Spearman's rank correlation coefficient - NS non-significant – HS highly significant

Table (7): Binary Logistic Regression of Measured Variables as Predictor of SUI

	SUI		OR	95% CI
	Cases	**Control**		
Mode of delivery				
Vaginal delivery	66	41	3.86	1.87 to 7.97
Cesarean delivery	14	39		
Gravidity				
≥ 4	23	18	0.7	0.33 to 1.5
< 4	57	62		
Parity				
≥ 4	6	4	0.5	0.1 to 2.7
< 4	74	76		

OR odds ratio, 95% CI 95% confidence interval