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Original Article

Effects of delivery mode and sociodemographic factors on postpartum stress urinary incontinency in primipara women: A prospective cohort study

Roya Kokabi [a], Dorna Yazdanpanah [b,*]

[a] Department Obstetrics and Gynecology, Fasa University of Medical Sciences, Fasa, Iran
[b] Student Research Committee, Fasa University of Medical Sciences, Fasa, Iran

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Abstract

Background: To determine the frequency of postpartum stress urinary incontinence (SUI) in women undergoing vaginal delivery or elective cesarean section and to investigate the sociodemographic determinants of SUI in a sample of Iranian patients.
Methods: This prospective cohort study was performed during a 1-year period from 2014 to 2015 including 286 healthy nulliparous women in the third trimester of pregnancy without prepregnancy urinary incontinence. Participants were categorized based on the mode of delivery, i.e., vaginal delivery ($n = 148$) and elective cesarean section ($n = 138$). SUI was evaluated in all the participants before delivery and at 1 month, 6 months, and 12 months after delivery using a previously validated Persian questionnaire. The frequency of postpartum SUI was recorded in both study groups and was compared between them. We also determined the sociodemographic determinants of SUI.
Results: Baseline characteristics were comparable. The frequency of postpartum SUI was significantly higher in vaginal delivery than in cesarean section after a 1-month ($p < 0.001$), 6-month ($p < 0.001$), and 12-month ($p < 0.001$) period. Age was found to be associated with increased frequency of postpartum SUI in both vaginal delivery ($p = 0.021$, $r = 0.286$) and cesarean section groups ($p = 0.043$, $r = 0.125$). SUI was associated with tool-assisted vaginal delivery ($p < 0.001$) and episiotomy ($p < 0.001$). The birth weight was positively correlated with increased frequency of postpartum SUI in both vaginal delivery ($p = 0.011$, $r = 0.546$) and cesarean section ($p = 0.034$, $r = 0.311$). Patients with SUI had a significantly higher body mass index than the normal individuals ($p = 0.038$). SUI was associated with lower income ($p = 0.028$) and lower neighborhood residence ($p = 0.033$).
Conclusion: Vaginal delivery is associated with a twofold increased risk of postpartum SUI in primipara women compared with elective cesarean section. Age and birth weight are the main risk factors of postpartum SUI in both modes of delivery. Tool-assisted delivery and episiotomy were determined as the risk factors of postpartum SUI in vaginal delivery.

Keywords: cesarean section; frequency; sociodemographic determinants; stress urinary incontinence; vaginal delivery

1. Introduction

Urinary incontinence (UI) is among the highly prevalent and global health problems associated with high social and economic burden, affecting quality of life in a negative fashion. The prevalence of the condition is about 31–60% during pregnancy, which decreases to 9% shortly after delivery.[1,2] Stress urinary incontinence (SUI) is one of the subtypes of UI which is defined as the involuntary loss of urine on effort or physical exertion, or on sneezing, or coughing.[3] It is rare in men but common in women. The prevalence and severity increases with age and parity and both are established risk factors of the condition.[4,5] The etiology is believed to be multifactorial. It is postulated that traumatic injuries to fascial and muscular supports of the bladder neck and urinary

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* Corresponding author. Dr. Dorna Yazdanpanah, Student Research Committee, Fasa University of Medical Sciences, Rezvanieh Avenue, Fasa 7461686688, Iran.
E-mail address: yazdanpanahd@yahoo.com (D. Yazdanpanah).

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sphincter during delivery is the main pathomechanism of SUI. However, pregnancy itself may cause mechanical changes, hormonal changes, or both, that can lead to UI.[6]

There are increasing evidences supporting the concept of permanent pelvic floor damage after vaginal delivery. Cesarean delivery, particularly prelabor cesarean, is believed to offer substantial protection against such pelvic floor trauma; in contrast, tool-assisted vaginal delivery, with vacuum or forceps, is believed to carry increased risks of trauma. An extensive body of evidence from the 1st year after delivery demonstrates that in this initial postpartum period, rates of SUI are higher in women undergoing vaginal delivery than in those undergoing cesarean delivery.[7,8] However, the long-term effects of the delivery mode are more important to patients than transient postpartum incontinence. The results of the current literature demonstrate that the mode of delivery is associated with rate of postpartum SUI.[9–11] In addition, there are many sociodemographic factors (cultural background) that are associated with postpartum SUI. Although previous studies have addressed this issue in different patient populations, data from Iran is scarce.[12,13] Thus, we performed the current study to determine the association between the delivery mode and the incidence of postpartum SUI in a series of Iranian women. We also investigated the role of sociodemographic factors or postpartum SUI in this population.

2. Methods

2.1. Study population

This prospective cohort study was conducted during a 1-year period from September 2014 to September 2015 in Zeinabieh Hospital, a tertiary obstetrics referral center in Southern Iran affiliated with Shiraz University of Medical Sciences. The study protocol was approved by the Institutional Review Board and Medical Ethics Committee of Shiraz University of Medical Sciences. All the participants provided their informed written consent before inclusion in the study. We included 288 healthy pregnant women who were nulliparous, Iranian, during the third trimester of pregnancy, and had willingness to participate. Exclusion criteria were multiparity and multifetal, chronic or systemic illnesses, such as diabetes, hypertension, urinary tract infection, and use of medications other than routine prenatal supplements. We also excluded those who had SUI or any subgroup of UI before delivery.

2.2. Study protocol

All the participants were recruited during the prenatal visits of the third trimester. All the participants were visited and a complete history and physical exam was performed, and the data was recorded in a data gathering form. The sociodemographic factors included education, comorbidities (diabetes mellitus, hypertension), religion (Shia or Sunni Islam), ethnicity, income, and neighborhood residence. We also recorded the baseline body mass index (BMI). We used a simple questionnaire to detect SUI. This questionnaire has been previously described and validated in Persian for the evaluation of SUI in women.[14] It includes questions about UI, and the analysis of the answers indicates that women who experience daily episodes of UI precipitated by physical activity or exercise have clinical SUI. The questionnaire was first administered between the 24th week and 28th week of pregnancy. Data from the labor and delivery of each participant were recorded prospectively. The mode of delivery in the current study included vaginal delivery and elective cesarean section (performed before the active phase of labor). Each participant was given the same questionnaire 1 month, 6 months, and 12 months postpartum. Episiotomy was performed in patients with imminent severe perineal rupture, instrumental delivery, shoulder dystocia, prolonged second stage of labor, and nonreassuring fetal heart rate. Participants who did not respond were excluded from the study. Independent variables included nominal and interval variables. Nominal variables included mode of delivery and episiotomy. Interval variables consisted of birth weight, head circumference, maternal age at the time of delivery, maternal BMI, gestational age at the time of delivery, and duration of the second stage of labor. The results were compared between the two study groups.

2.3. Statistical analysis

Based on 80% power to detect 5% difference between the postpartum frequencies of SUI between the two study groups with α error equal to 0.05, we needed 140 participants in each study group. In order to compensate for nonevaluable patients, we included 286 women (148 in vaginal delivery group and 138 in elective cesarean section group). All the statistical analyses were performed using SPSS software (Version 16.0; SPSS Inc., Chicago, Illinois, USA). Data are presented as mean $\pm$ SD and proportions as appropriate. Nonparametric data were compared using chi-square test, whereas the parametric data were compared using the independent t test. For assessment of linear correlation between parametric variables, we used Pearson correlation analysis for which correlation coefficient (r value) was reported. A two-sided p value < 0.05 was considered statistically significant.

3. Results

Overall we included 286 healthy nulliparous pregnant women during the third trimester in two study groups based on the mode of delivery (148 in vaginal delivery group and 138 in elective cesarean section group). All the patients followed the study and thus were included in the final analysis. The mean age of the participants was 29.1 $\pm$ 7.2 years. There was no significant difference between the two study groups regarding the baseline characteristics (Table 1). The overall postpartum frequency of SUI in 1-month follow-up was 32 (11.2%), which decreased to 27 (9.4%) and 19 (6.4%) after a 6-month and 12-month period ($p < 0.001$%). The frequency of postpartum SUI was significantly higher in vaginal delivery than in cesarean section after 1 month [14.2% vs. 7.9%; $p < 0.001$; odd ratio

Table 1
Baseline characteristics of 286 healthy nulliparous women in third trimester included in the current cohort study.

	Vaginal delivery ($n = 148$)	Cesarean section ($n = 138$)	p
Age (y)	28.7 ± 7.8	29.5 ± 6.2	0.371
Education			
Illiterate	3 (2.0)	2 (1.4)	
Preliminary School	56 (37.8)	42 (30.4)	0.129
High School	67 (45.3)	61 (44.2)	
Academic	22 (14.9)	33 (23.9)	
Tool delivery	31 (20.9)	—	—
Episiotomy	38 (27.3)	—	—
Birth weight (g)	3205.8 ± 312.6	3018.4 ± 458.1	0.095

Data are presented mean ± standard deviation or n (%).

(OR) 95% confidence interval (CI) = 2.3 (0.6−4.3)]. In the same way the frequency was significantly higher in a 6-month [12.2% vs. 6.5%; $p < 0.001$; OR 95% CI = 2.6 (0.3−4.8)] and 12-month [14.2% vs. 7.9%; $p < 0.001$; OR 95% CI = 1.8 (1.1−3.7)] period in the vaginal delivery group than in the cesarean section group (Table 2).

We also determined the risk factors of SUI in these groups of women. Age was found to be associated with an increased frequency of postpartum SUI in both vaginal delivery ($p = 0.021$, $r = 0.286$) and cesarean section groups ($p = 0.043$, $r = 0.125$). We found that the frequency of SUI was significantly higher in those who had tool-assisted vaginal delivery than in those without tool-assisted vaginal delivery [10.1% vs. 4.1%; $p < 0.001$; OR 95% CI = 3.4 (0.9−6.6)]. The frequency of SUI was also higher in those who had episiotomy during vaginal delivery [11.5% vs. 2.7%; $p < 0.001$; OR 95% CI = 5.7 (2.6−9.7)]. The level of education was not associated with SUI in both vaginal delivery ($p = 0.422$) and cesarean section ($p = 0.385$) groups. The birth weight was positively correlated with an increased frequency of postpartum SUI in both vaginal delivery ($p = 0.011$, $r = 0.546$) and cesarean section ($p = 0.034$, $r = 0.311$) groups.

The sociodemographic determinants of SUI are summarized in Table 3. We found that patients with SUI had a significantly higher BMI than the normal individuals ($p = 0.038$). SUI was associated with lower income ($p = 0.028$) and lower neighborhood residence ($p = 0.033$). We did not find any association between SUI and level of education ($p = 0.061$), religion ($p = 0.259$), and ethnicity ($p = 0.072$). Neither diabetes mellitus ($p = 0.823$) nor hypertension ($p = 0.587$) were associated with SUI. Although the frequency of depression was higher in patients with SUI, the difference did not reach statistical significance (21.8% vs. 16.9%; $p = 0.079$).

Table 2
Frequency of postpartum stress urinary incontinence in 286 healthy nulliparous women in third trimester included in the current cohort study.

	Vaginal delivery ($n = 148$)	Cesarean section ($n = 138$)	p	OR (95% CI)
Stress urinary incontinency				
1 mo	21 (14.2)	11 (7.9)	< 0.001	2.3 (0.6−4.3)
6 mo	18 (12.2)	9 (6.5)	< 0.001	2.6 (0.3−4.8)
12 mo	14 (9.45)	5 (3.6)	< 0.001	1.8 (1.1−3.7)

Data are presented as n (%).
CI = confidence interval; OR = odds ratio.

Table 3
Cultural background of 286 healthy nulliparous women with or without postpartum stress urinary incontinence included in the current cohort study.

	SUI ($n = 32$)	Normal ($n = 254$)	p
Age (y)	33.1 ± 8.6	27.6 ± 10.3	0.023
BMI (kg/m^2)	28.6 ± 5.3	24.3 ± 3.6	0.038
Comorbidities			
Diabetes mellitus	8 (25.0)	66 (25.9)	0.823
Hypertension	4 (12.5)	29 (11.4)	0.587
Depression	7 (21.8)	43 (16.9)	0.079
Education			
Illiterate	2 (6.2)	3 (1.1)	0.061
Preliminary school	11 (34.3)	87 (34.2)	
High School	10 (31.2)	118 (46.4)	
Academic	9 (28.3)	46 (18.3)	
Religion			
Shia Islam	21 (65.7)	159 (62.6)	0.259
Sunni Islam	11 (34.3)	90 (37.4)	
Ethnicity			
Fars	19 (59.3)	168 (66.2)	0.072
Afghan	6 (18.8)	56 (22.1)	
Arab	5 (15.7)	22 (8.6)	
Other	2 (6.2)	8 (3.1)	
Income			
Low (< 400 USD/mo)	7 (21.8)	38 (14.9)	0.028
Mid (400−1000 USD/mo)	16 (49.9)	102 (40.3)	
High (≥ 1000 USD/mo)	9 (28.3)	114 (44.8)	
Neighborhood residence			
Low	10 (31.2)	42 (16.5)	0.033
Mid	15 (47.0)	108 (42.6)	
High	7 (21.8)	104 (40.9)	

Data are presented as mean ± standard deviation or n (%).
BMI = body mass index; SUI = stress urinary incontinence.

4. Discussion

This cohort study of Iranian primipara women demonstrated that vaginal delivery is associated with a twofold increased risk of developing postpartum SUI. This is consistent with previous studies.[1,14−17] A recent meta-analysis of data from 15 cross-sectional studies demonstrated an almost twofold increase in the risk of developing long-term SUI, an absolute increase of approximately 8% in moderate or severe SUI when comparing any vaginal delivery with cesarean section. The impact was age-dependent and decreased in cohorts of older women. Ascertained at age 65 years, the OR associated with vaginal delivery versus cesarean was 2.51; ascertained at age 60 years, the OR was 1.29. This difference in gradient reflects the increasing incidence of incontinence for reasons other than the mode of delivery as women age.[15] The OR for SUI in vaginal delivery compared with that in elective cesarean section in the current study was 2.3 (0.6−4.3) 1 month after the delivery, and 2.6 (0.3−4.8) and 1.8

(1.1−3.7) for 6 months and 12 months, respectively. This clearly demonstrates that vaginal delivery increases the risk of postpartum SUI in healthy primipara women.

It was reported that when SUI is compared with specifically elective cesarean, the risk is over three times higher, an absolute increase of >10%. Tahtinen et al[15] also showed a small increased risk of urge UI (UUI) after vaginal delivery compared with cesarean, an absolute increase of approximately 3%. Results showed no difference in the risk of SUI when comparing instrumental vaginal delivery and spontaneous vaginal delivery.[14,15] This is not consistent with our findings. We found that the tool-assisted vaginal delivery compared with spontaneous vaginal delivery increases the risk of SUI by threefold [3.4 (0.9−6.6)]. In the same way, the episiotomy increased the risk of SUI by fivefold [5.7 (2.6−9.7)]. Apart from one randomized trial[18−22] including only breech presentations, only one optimally adjusted longitudinal study addressed the question of interest.[23] In this study, symptoms related to SUI and UUI were more common and of greater severity after vaginal delivery than those after cesarean birth. Consistent with results in our meta-regression of age on effect size, SUI symptom differences between these two groups decreased with increasing time from childbirth.

Incontinence is very common among women irrespective of delivery history; prevalence estimates vary from 2.8% to 30.8% for SUI and from 0.7% to 19.9% for UUI.[24] Therefore, potentially increasing use of cesarean section may have beneficial public health consequences from the perspective of pelvic floor health, including decreased need for SUI and pelvic organ prolapse surgery.[25,26] Our results are consistent with those of a Swedish cohort study[27] that reported vaginal deliveries increased SUI and thus the surgical treatment for incontinence (hazard ratio = 2.9; 95% CI = 2.4−3.6) compared with women only having cesarean deliveries. The increased risk persisted for > 3 decades.[25] The estimates provided here may be useful when counseling women about the risk and benefits of different delivery modes. Although we have quantified one benefit of planned cesarean, women and their caregivers must consider other consequences. Planned cesarean section confers an increased risk of neonatal intensive care admission for the baby and a substantially longer hospital stay for the mother.[10] A prior cesarean also carries risks in future pregnancies, including an increased risk of uterine rupture and abnormal placentation. In general, the medicalization of pregnancy associated with planned cesarean may also be undesirable from both individual and societal perspectives.[28]

The sociodemographic factors associated with SUI were also investigated in the current study. We found that patients with lower income and lower neighborhood residence had a significantly higher incidence of postpartum SUI. However, there was no association between postpartum SUI and educational level, ethnicity, and religion. Data regarding cultural background of SUI is scarce in the literature. Waetjen et al[13] determined the association between sociodemographic factors and seeking medical assistance for SUI. They found no evidence of racial or ethnic, socioeconomic, or education level disparities in SUI treatment-seeking. Rather, longitudinal UI characteristics were most strongly associated with treatment-seeking behavior in midlife women.[13] Coyne et al[29] also determined the health-related quality of life in patients with SUI and also determined the sociodemographics associated with the condition. They reported worse health-related quality of life in patients with SUI; however, they reported no sociodemographic association between the conditions.[29] Considering all these together, the results of the current study are among the only available data regarding the sociodemographic factors of postpartum SUI.

There are some limitations to our study. First, we included a limited number of participants. However, the power calculation demonstrates that the study has 80% power to detect 5% difference between the two study groups regarding the frequency of SUI. Second, we followed the patients for 1 year, which is a limited period of time. Thus, we cannot comment on the long-term results of these modes of delivery. Extended studies are required to shed light on the long- term effects of mode of delivery on SUI.

In conclusion, vaginal delivery is associated with a twofold increased risk of postpartum SUI in primipara women compared with elective cesarean section. Age and birth weight are the main risk factors of postpartum SUI in both modes of delivery. Tool-assisted delivery and episiotomy were determined as the risk factors of postpartum SUI in vaginal delivery.

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