



EARLY POSTPARTUM STRESS URINARY INCONTINENCE FOLLOWING VAGINAL AND CAESAREAN DELIVERY: A MULTI-CENTER ANALYTICAL STUDY FROM TERTIARY CARE HOSPITALS IN PAKISTAN

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Abstract

Objective: To compare the prevalence, severity, and risk factors of early postpartum stress urinary incontinence (SUI) among women following vaginal delivery (VD) and caesarean section (CS) across four provinces in Pakistan.

Methods: This multi-center analytical cross-sectional study was conducted from June 2024 to February 2025 in tertiary care teaching hospitals located in Lahore, Karachi, Peshawar, and Quetta. A total of 270 women (135 VD; 135 CS) were recruited at 6–8 weeks postpartum through consecutive sampling. Data were collected using the International Consultation on Incontinence Questionnaire–Urinary Incontinence Short Form (ICIQ–UI SF). Statistical analysis included Chi-square testing and multivariable logistic regression using SPSS version 26.0.

Results: Overall prevalence of SUI was **23.3% (63/270)**. SUI occurred significantly more often in the vaginal delivery group (**31.1%**) compared with the caesarean section group (**15.5%**, $p=0.004$). Mean ICIQ scores were significantly higher in the VD group (8.4 ± 3.1) than in the CS group (4.2 ± 1.8 , $p < 0.001$). Multivariable regression identified neonatal birth weight >3.5 kg (OR=2.42), vaginal delivery (OR=2.25), maternal BMI >30 kg/m² (OR=1.98), and maternal age >30 years (OR=1.85) as significant predictors of early postpartum SUI.

Conclusion: Early postpartum stress urinary incontinence is common among Pakistani women. Vaginal delivery approximately doubles the risk compared with caesarean delivery, although

pregnancy itself contributes to pelvic floor dysfunction. Routine screening during postnatal visits may improve early detection and management.

Keywords: Stress urinary incontinence, postpartum, vaginal delivery, cesarean section, pelvic floor dysfunction, Pakistan.

1. Introduction

Stress urinary incontinence (SUI) is defined as the involuntary leakage of urine during activities that increase intra-abdominal pressure such as coughing, sneezing, or physical exertion (1). It represents one of the most common forms of urinary incontinence among women and frequently develops after pregnancy and childbirth. Although not life-threatening, SUI can significantly impair quality of life by affecting physical activity, emotional well-being, and social participation (1-2)

Pregnancy and childbirth exert considerable mechanical and hormonal stress on the pelvic floor. Vaginal delivery has been particularly associated with stretching and potential injury to pelvic floor muscles, connective tissue, and pudendal nerves. These structural changes can compromise urethral support and lead to urinary leakage during increases in abdominal pressure.(3,4,6)

While cesarean delivery is often perceived as protective against pelvic floor injury, studies suggest that pregnancy itself may contribute to urinary incontinence through hormonal changes and prolonged pressure from the gravid uterus. Consequently, urinary symptoms have also been observed among women who undergo cesarean delivery.

In many low- and middle-income countries, including Pakistan, postpartum maternal morbidities such as urinary incontinence remain underreported. Cultural stigma, limited awareness, and inadequate postnatal screening contribute to delayed diagnosis and treatment. Most postpartum care programs primarily focus on neonatal outcomes, often overlooking pelvic floor disorders.(1,5)

Despite the clinical relevance of SUI, multi-center comparative data from Pakistan examining the relationship between delivery mode and early postpartum urinary symptoms are limited. This study aims to compare the prevalence, severity, and associated risk factors of stress urinary incontinence among women following vaginal and cesarean delivery in tertiary care hospitals across Pakistan.(12-13-32)

2. Methodology

Study Design and Setting

This multi-center analytical cross-sectional study was conducted between June 2024 and February 2025 in tertiary care teaching hospitals located in Lahore, Karachi, Peshawar, and Quetta, representing the four provinces of Pakistan. These institutions provide specialized obstetric services and postgraduate clinical training.

Study Population

Women attending postnatal follow-up clinics 6–8 weeks after delivery were considered eligible for participation.

Sample Size

Sample size was calculated using OpenEpi software for comparison of two proportions with a 95% confidence level and 80% power. Based on previous estimates of postpartum SUI prevalence following vaginal delivery (30%) and cesarean delivery (15%), the minimum required sample size was 242 participants. After accounting for potential non-response, a final sample size of **270 women** was included.

Sampling Technique

Participants were recruited using **consecutive non-probability sampling** at each participating hospital until the required sample size was achieved.

Inclusion Criteria

- Women aged 18–45 years
- 6–8 weeks postpartum
- Vaginal or cesarean delivery
- Provided written informed consent

Exclusion Criteria

- History of urinary incontinence before pregnancy
- Neurological disorders affecting bladder function
- Multiple pregnancy
- Previous pelvic floor or urological surgery

Data Collection

Data were collected using two instruments:

1. Structured demographic and obstetric questionnaire
2. International Consultation on Incontinence Questionnaire–Urinary Incontinence Short Form (ICIQ-UI SF)

The ICIQ-UI SF is a validated tool used to assess the presence and severity of urinary incontinence symptoms.

Participants were interviewed privately to ensure confidentiality.

Statistical Analysis

Data were analyzed using **SPSS version 26.0**.

Statistical methods included:

- Descriptive statistics for demographic variables
- Chi-square test to compare prevalence between groups
- Independent t-test for mean severity scores
- Multivariable logistic regression to identify risk factors

Statistical significance was defined as **p <0.05**.

3. Results

Participant Characteristics

A total of 270 women participated in the study, with 135 in the vaginal delivery group and 135 in the cesarean section group. The mean age of participants was 28.4 ± 4.2 years. Both groups were comparable in terms of age, BMI, and place of residence. However, the proportion of multiparous women was significantly higher in the vaginal delivery group (62%) compared with the cesarean group (48%, $p=0.021$).

Prevalence of Stress Urinary Incontinence

Overall prevalence of postpartum SUI was **23.3% (63/270)**.

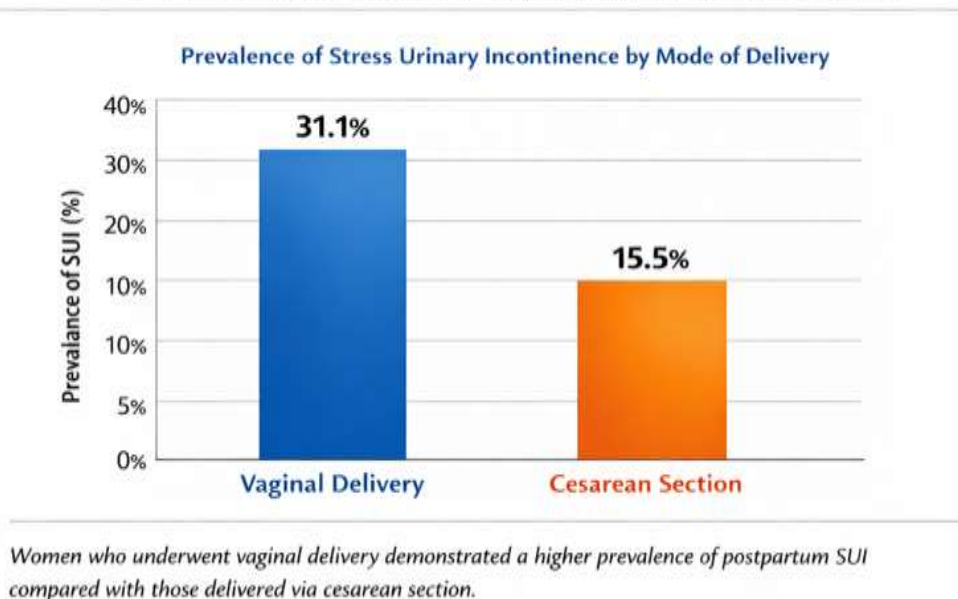
Table 1: Prevalence of SUI by Mode of Delivery

Mode of Delivery	SUI Present (n, %)	SUI Absent (n, %)	Total	p-value
Vaginal Delivery	42 (31.1%)	93 (68.9%)	135	

Cesarean Section	21 (15.5%)	114 (84.5%)	135	0.004
Total	63 (23.3%)	207 (76.7%)	270	

The prevalence of SUI in the vaginal delivery group was **approximately twice that observed in the cesarean group**, indicating a strong association between vaginal delivery and early postpartum urinary symptoms.

Figure 1. Prevalence of stress urinary incontinence by mode of delivery.



Severity of Symptoms

Among the **63 women reporting SUI**, symptom severity was evaluated using the ICIQ-UI SF score.

Table 2 Severity of SUI Symptoms

Severity Category	VD Group (n=42)	CS Group (n=21)
Mild (1–5)	14 (33.3%)	16 (76.2%)
Moderate (6–12)	22 (52.4%)	5 (23.8%)
Severe (13–21)	6 (14.3%)	0

The mean severity score was significantly higher in the vaginal delivery group (8.4 ± 3.1) compared with the cesarean group (4.2 ± 1.8 , $p < 0.001$). Severe SUI was observed exclusively among women who underwent vaginal delivery.

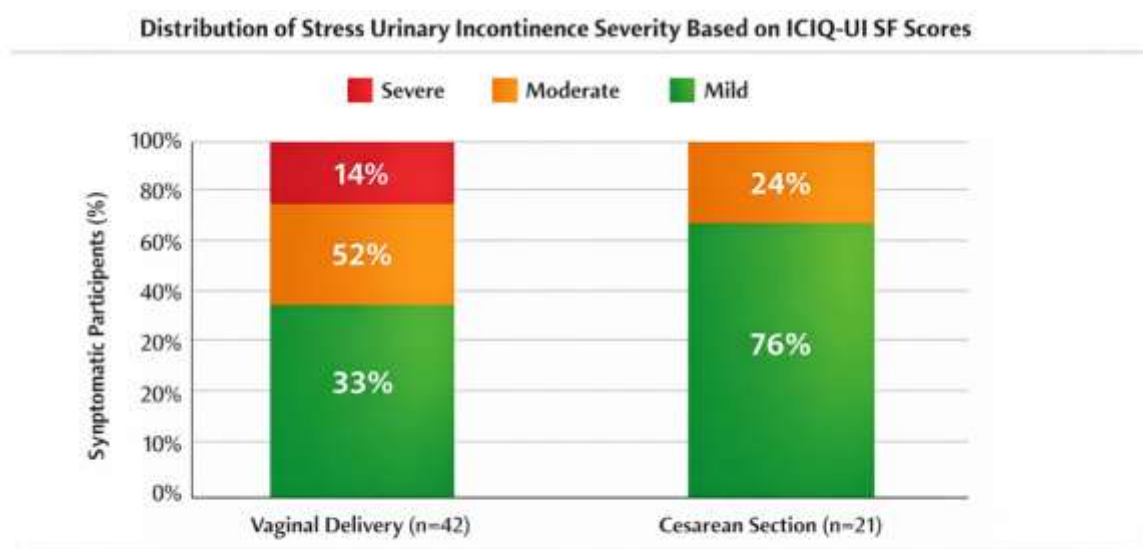


Figure 2. Distribution of stress urinary incontinence severity among symptomatic women following vaginal delivery (n = 42) and cesarean section (n = 21) based on ICIQ-UI SF scores.

Risk Factor Analysis

Multivariable logistic regression identified several independent predictors of postpartum SUI.

Table 3: Independent Risk Factors for SUI

Variable	Odds Ratio	95% CI	p-value
Birth Weight >3.5 kg	2.42	1.45–4.02	0.001
Vaginal Delivery	2.25	1.29–3.92	0.004
BMI >30 kg/m ²	1.98	1.20–3.28	0.009
Maternal Age >30 years	1.85	1.12–3.05	0.016

4. Discussion

This multi-center study examined the prevalence and predictors of early postpartum stress urinary incontinence among Pakistani women following vaginal and cesarean delivery. Our findings demonstrate that SUI is a relatively common postpartum condition, affecting nearly one quarter of women in the early postpartum period. These findings highlight the importance of postpartum pelvic floor assessment in routine maternal healthcare.

In this study, women who underwent vaginal delivery were approximately twice as likely to experience SUI compared with women who delivered by cesarean section. This observation is consistent with previous international research demonstrating that vaginal delivery is strongly associated with pelvic floor trauma and urinary incontinence (4,5,6). Rortveit et al. reported that women who experienced vaginal delivery had a significantly higher risk of developing urinary incontinence compared with those who underwent cesarean delivery (4). The mechanism is believed to involve stretching or injury of the levator ani muscles and pudendal nerve during labor and delivery (9,13).

Similarly, Tähtinen et al. found that vaginal birth significantly increases the likelihood of pelvic floor disorders in the long term, particularly when compared with cesarean delivery performed before labor (5). MacArthur and colleagues also reported increased urinary incontinence symptoms following vaginal delivery due to damage to pelvic floor support structures (6). These structural injuries may impair urethral support and reduce the ability of the pelvic floor muscles to maintain continence during increases in intra-abdominal pressure (14).

Despite the protective effect often attributed to cesarean delivery, our study identified urinary incontinence in 15.5% of women who underwent cesarean section. This finding suggests that pregnancy itself may contribute to pelvic floor dysfunction independent of delivery mode. During pregnancy, hormonal changes such as increased relaxin and progesterone levels weaken connective tissues supporting the pelvic organs (15,16). Additionally, prolonged pressure from the gravid uterus can affect pelvic floor muscle tone and urethral support (17).

The severity analysis revealed that moderate-to-severe symptoms were more common in women who experienced vaginal delivery. Severe SUI was observed exclusively in this group. Similar observations have been reported in previous studies, which demonstrate that pelvic floor muscle stretching and nerve injury during vaginal birth contribute to both the development and severity of urinary symptoms (18,19).

One of the most important findings of this study was the identification of neonatal birth weight greater than 3.5 kg as the strongest independent predictor of postpartum SUI. Fetal macrosomia increases mechanical stress on the pelvic floor during pregnancy and delivery, potentially leading to muscle and connective tissue damage (20). Previous research has consistently demonstrated an association between higher neonatal birth weight and increased risk of pelvic floor disorders (21,22). Larger fetal size may also prolong the second stage of labor, further increasing the likelihood of pelvic floor trauma.

Maternal obesity was another significant risk factor identified in this study. Women with a BMI greater than 30 kg/m² had nearly twice the risk of developing postpartum urinary incontinence compared with women with lower BMI. Obesity is known to increase intra-abdominal pressure, which can chronically stress pelvic floor muscles and connective tissue (23). Several epidemiological studies have reported strong associations between obesity and urinary incontinence among women (24,25).

Advanced maternal age also emerged as a significant predictor of postpartum SUI. Increasing maternal age may reduce the elasticity and regenerative capacity of pelvic connective tissues, making them more susceptible to injury during pregnancy and childbirth (26). Previous population-based studies have also reported increased prevalence of urinary incontinence among older mothers (27).

An important finding in this study was the limited communication between patients and healthcare providers regarding urinary symptoms. Although more than 12% of participants required referral for specialized urological evaluation, very few had previously discussed these symptoms with a healthcare professional. Similar patterns have been observed in other studies conducted in low- and middle-income countries, where cultural stigma and limited awareness often prevent women from seeking help for pelvic floor disorders (7,28).

The lack of routine postpartum screening programs may further contribute to underdiagnosis. Several international organizations recommend structured assessment of pelvic floor health during postnatal follow-up visits (29). Early identification of urinary symptoms allows timely implementation of conservative interventions such as pelvic floor muscle training, which has been shown to significantly reduce urinary incontinence symptoms (30,31).

In Pakistan, postpartum care services often focus primarily on neonatal outcomes and immediate obstetric complications. Consequently, long-term maternal morbidities such as urinary incontinence receive limited attention. Integrating simple screening tools such as the **ICIQ-UI SF** into routine postnatal assessments could significantly improve early detection of pelvic floor dysfunction (12,32). From a clinical perspective, the findings of this study highlight the need for multidisciplinary collaboration between obstetricians, gynecologists, and urologists in managing postpartum pelvic floor disorders. Preventive strategies including patient counseling, early pelvic floor rehabilitation, and lifestyle modifications may help reduce the burden of postpartum urinary incontinence (33).

Overall, this study contributes important national evidence regarding postpartum stress urinary incontinence in Pakistan. The multi-center design strengthens the generalizability of the findings and provides insight into risk factors relevant to the local population. Further longitudinal studies are needed to evaluate long-term outcomes and the effectiveness of preventive interventions.

Limitations

This study has several limitations. First, the cross-sectional design limits the ability to establish causal relationships between delivery mode and urinary incontinence. Second, urinary symptoms were assessed through self-reported questionnaires, which may introduce reporting bias. Finally, although the study included hospitals from four provinces, the findings may not be fully generalizable to rural populations.

Conclusion

Stress urinary incontinence is a common early postpartum morbidity among Pakistani women. Vaginal delivery significantly increases the risk compared with cesarean section, although pregnancy itself contributes to pelvic floor dysfunction. Neonatal birth weight, maternal obesity, and advanced maternal age also play important roles.

Routine postpartum screening for urinary incontinence using standardized tools such as the ICIQ-UI SF may facilitate early identification and timely referral for specialized care

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