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Postpartum stress urinary incontinence: a clinical study of 6,302 cases in Jiangsu Province

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Running title: Clinical study of postpartum SUI

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ABSTRACT

Objectives: To investigate the prevalence and influencing factors of stress urinary incontinence (SUI) within 6–8 weeks postpartum in Jiangsu Province.

Material and methods: We designed a multi-center cross-sectional study involving seven hospitals in Jiangsu province, and enrolled women who underwent postpartum examination at 6–8 weeks in these hospitals between July 2019 and June 2021. According to the presence or absence of SUI, the enrolled patients were divided into two groups: the SUI group and the non-SUI group, respectively. We assessed the general health status, noted the details of delivery, and checked the pelvic floor electromyographic parameters of the postpartum women in both groups.

Results: Among 6,302 cases of postpartum women in Jiangsu province, there were 1,579 cases of SUI, with a prevalence of 25.06%. The prevalence of SUI increased significantly with age, BMI, increasing parity, coexisting constipation, organ prolapse, and diastasis recti abdominis. Compared to the non-SUI group, the SUI group had a lower mean value of the pre-baseline rest phase, shorter rise and fall times of fast muscle contractions, and a lower mean value of the endurance contraction phase. Multiple regression analysis revealed associations with weight (especially overweight and obesity), coexisting organ prolapse, constipation, parity, gestational week of delivery, mode of delivery, and mean value of endurance contraction phase.

Conclusions: The prevalence of postpartum stress urinary incontinence in Jiangsu Province was 25.06%, and was linked to being overweight, parity > 2, coexisting organ prolapse, constipation, and a decrease in the mean value of the endurance contraction phase of the electromyograph. In this report, we offer a theoretical basis for the effective prevention of postpartum SUI clinically.

Key words: clinical study; Glazer Protocol; influencing factors; postpartum; stress urinary incontinence

INTRODUCTION

Urinary incontinence (UI) refers to the involuntary leakage of urine in any situation and is one of the major conditions affecting daily activities. The prevalence is twice as high in women as in men, with a higher incidence with age [1]. Stress urinary incontinence (SUI) is the most common subtype of UI. It is estimated that 20% of women have symptoms of SUI. SUI in women not only affects their quality of life, but also causes psychological and social problems such as depression, social isolation, reduced self-confidence, family disharmony, and other related health issues, making this one of the most important chronic diseases impacting public health. History of pregnancy and childbirth are considered independent risk factors for UI. The probability of UI after vaginal delivery is 50%. One study reported the prevalence of SUI to be 18.41% in 1,211 postpartum women [2]. Hill et al. [3] reported a 41% incidence of UI among 597 primiparous women aged over 18 years at one year postpartum. A cross-sectional study found that the incidence of UI during pregnancy and postpartum was 33.3% and 25.2%, respectively [4]. Given the high prevalence of SUI reported in literature, it is important to first study the prevalence of SUI in any region in order to better develop strategies for the prevention and treatment of SUI. Therefore, in this study, we primarily aimed to investigate the prevalence and influencing factors of postpartum SUI and its influencing factors in Jiangsu Province.

MATERIAL AND METHODS

Details of the study

Type of study

This was a multi-center cross-sectional study initiated by the Jiangsu Province Association of Maternal and Child Health and led by the Jiangsu Women And Children Health Hospital, with the participation of seven hospitals including the Affiliated Jiangning Hospital of Nanjing Medical University, Jiangning Maternal and Child Health Hospital, Suzhou Wuzhong People's Hospital, Jiangyin People's Hospital, Affiliated Hospital of Jiangnan University, Taizhou People's Hospital, Affiliated Maternity and Child Health Care Hospital of Nantong University, and Xuzhou Central Hospital. When the project commenced, all project researchers received training on the standardized operational procedures to be used for the study. Data was collected as per the medical record system developed by the Nanjing McLand Institute of Medical Technology, with two people entering the data to ensure data integrity and accuracy.

Quality control

We conducted monthly real-time quality control after the project started, and quality control meetings were held every 3–6 months to identify problems for timely rectification.

Study respondents

We enrolled patients who underwent postpartum examination at 6–8 weeks in the above seven hospitals between July 2019 and June 2021. All the patients answered a survey questionnaire and underwent the Glazer Protocol pelvic floor surface electromyography assessment. Inclusion criteria: 1. Healthy on physical examination at 6–8 weeks postpartum; 2. History of one or two monotocous deliveries; 3. Voluntary participation in this study; 4. No psychological or comprehension difficulties or cognitive abnormalities; 5. No lochia infection. Exclusion criteria: 1. Twin or multiparous pregnancies; 2. Parity above 3; 3. Incomplete medical history; 4. Logical errors in the data; 5. Vaginal spasms and unable to tolerate vaginal probe examination; 6. Previous history of pelvic floor surgery. According to the presence or absence of SUI, patients were divided into the following two groups, respectively: the SUI group (n = 1,579) and the non-SUI group (n = 4,723). The study was approved by the Medical Ethics Committee of the Jiangsu Provincial People's Hospital (ethics number: 2019-SR-262). All the respondents signed the informed consent form.

Study methods

All patients who underwent postpartum examination at 6–8 weeks in the above-mentioned hospitals signed informed consent forms. Routine information (age, height, weight, delivery status, education, constipation, mode of last delivery, week of last pregnancy, and the newborn weight) was recorded. All patients also underwent a gynecological examination to check for coexisting organ prolapse and to determine diastasis recti abdominis via caliper measurement. Additionally, they answered the Pelvic Floor Dysfunction questionnaire, the Incontinence Quality of Life questionnaire (I-QOL) and underwent a pelvic floor surface EMG signal assessment. We used the pelvic floor surface EMG analysis and biofeedback training system (A2, Nanjing McLand Medical Technology Co., Ltd.) to assess the pelvic floor muscle function by collecting and measuring the pelvic floor EMG signals through a series of contraction and relaxation activities using vaginal electrodes (Glazer Protocol). Assessment steps (standard assessment) were as follows: (1) 60-second pre-baseline rest test to assess pelvic floor muscle function at rest; (2) five flick contractions with a 10-second rest in-between to assess pelvic floor fast muscle function; (3) five 10-second tonic contractions

with a 10-second rest in-between to assess pelvic floor fast and slow muscle function; (4) 60-second endurance contraction to assess pelvic floor slow muscle function ; (5) 60-second post-baseline rest test to assess the recovery function of pelvic floor muscles.

Evaluation indexes

Diastasis recti abdominis: using caliper measurement

The specific steps were as follows: The patient was made to lie in the supine position with knees bent and hands crossed over the shoulders, the examiners placed fingers on the patient's navel and instructed the patient to inhale, and then exhale with the head and shoulders gently lifted off the bed, as in the case of sit-ups. We measured the gap between the abdominal muscles with a ruler and made a diagnosis of diastasis recti abdominis when the gap was > 2 cm [5].

Pelvic floor muscle surface EMG assessment parameters (Glazer Protocol)

① Mean value and variability of pre-baseline rest EMG values; ② Maximum value, variability, and time of rapid contraction and relaxation of EMG values during 5 rapid contraction phases; ③ Mean value, variability, and time of relaxation of EMG values during 10 s sustained contraction phase; ④ Mean and variability of EMG values during 60 s endurance contraction phase; ⑤ Mean and variability of pre-rest EMG values.

Pelvic Floor Distress Inventory-short form 20 (PFDI-20)

The questionnaire has three scales pertaining to distress due to pelvic organ prolapse, fecal incontinence, and urinary incontinence. Each question is rated on a scale of 0–4, representing no symptoms, yes but no distress, mild distress, moderate distress, and severe distress, respectively. The higher the total score, the more serious the clinical symptoms of the patient and the greater the impact on life.

Incontinence quality of life questionnaire (I-QOL)

The questionnaire consists of 22 items, including subjective ratings of the degree of impact on patients' avoidance and limiting behavior, psychosocial impact, and social embarrassment, with the total scale score ranging from 0–100, and the higher the score, the higher the quality of life.

Statistical analysis

The raw data network was exported directly into Excel and then statistically analyzed using Stata 17.0. Data were analyzed using descriptive statistics and multivariate logistic regression. Quantitative data conforming to normal distribution were expressed as mean ± standard deviation, and comparisons were performed using a t-test. The dominance ratio (OR) and 95% confidence interval were calculated. All tests were two-sided, and $p < 0.05$ was considered statistically significant.

RESULTS

Basic information

There were 1,579 cases of SUI in 6,302 puerperia, with a prevalence of 25.06%. When we compared the SUI group with the non-SUI group, there was a statistically significant increase in patient age (29.28 ± 3.94 vs 28.88 ± 3.88, p = 0.000) and body mass index (BMI) (23.82 ± 3.25 vs 23.40 ± 5.50, p = 0.001). Compared to the non-SUI group, there were statistically significant differences in labor and exercise intensity in the SUI group. The prevalence of SUI was 23.51% in the cesarean delivery group compared to that of 26.04% in the normal delivery group. We also found a higher rate of normal delivery in the SUI group (63.52% vs 60.32%, *P* = 0.024). The prevalence of SUI increased with increasing parity (28.5% of 2-births history vs 23.31% of 1-birth history, p = 0.000). However, there was no difference compared to the gestational week of delivery (p = 0.126) and fetal weight (3.37 ± 0.55 vs 3.37 ± 0.51, p = 0.881). There was a statistically significant difference in the number of patients who had light labor and less exercise in the SUI group compared to the non-SUI group (p = 0.000). The prevalence of constipation was significantly higher in the SUI group than in the non-SUI group (26.28% vs 14.12%). Compared to the non-SUI group, combined organ prolapses and diastasis recti abdominis were more common in the SUI group, with a statistically significant difference (Tab. 1).

Results of the pelvic floor dysfunction questionnaire and quality of life questionnaire for urinary incontinence

In the SUI group, the PFDI-20 scores were significantly higher (21.74 ± 25.70 vs 8.04 ± 17.34, p = 0.000), while the I-QOL scores were significantly lower (94.70 ± 9.94 vs 98.78 ± 3.48, p = 0.000) compared to the non-SUI group (Tab. 2).

Pelvic floor electromyographic parameters

Compared to the non-SUI group, the SUI group had a lower mean value of pre-baseline

rest phase (5.38 ± 3.76 vs 5.71 ± 3.94, p = 0.003), shorter fast muscle contraction rise time (0.42 ± 0.19 vs 0.45 ± 0.22, p = 0.000) and fall time (0.54 ± 0.33 vs 0.57 ± 0.38, p = 0.005), and lower mean value of endurance contraction phase (21.70 ± 10.66 vs 22.45 ± 10.75, p = 0.016), all of which were statistically significant. However, the differences in the mean value, variability of the tonic contraction phase, variability of the endurance contraction phase, and variability of the post-baseline rest phase were not statistically significant (Tab. 3).

Influencing factors of UI

The prevalence of SUI among 6,302 postpartum women in Jiangsu Province was 25.06%. The univariate stratified analysis of influencing factors of SUI at 42 days postpartum found that the age between 31–34 years (OR 1.16, 95% CI 1.02–1.32, p = 0.021), non-standard weight (low weight OR 0.64, 95% CI 0.44–0.93, p = 0.019; overweight OR 1.27, 95% CI 1.10–1.48, p = 0.001; obesity OR 1.36, 95% CI 1.19–1.56, p = 0.000), increased parity (OR 1.31, 95% CI 1.17–1.48, p = 0.000), normal delivery (OR 0.87, 95% CI 0.78–0.98, p = 0.024), combined organ prolapse (OR 2.31, 95% CI 2.05–2.59, p = 0.000), constipation (OR 2.17, 95% CI 1.89–2.49, p =0.000), diastasis recti abdominis (OR 1.39, 95% CI 1.04–1.36, p = 0.010), and mean value of endurance contraction phase (OR 1.23, 95% CI 1.07–1.42, p = 0.002) were all associated with SUI. Our multiple logistic regression analysis showed that weight (especially being overweight and obesity), coexisting organ prolapse, constipation, parity, gestational week of delivery, mode of delivery, and mean value of endurance contraction phase were associated with SUI at 42 days postpartum (Tab. 4).

DISCUSSION

Stress urinary incontinence refers to the involuntary leakage of urine from the urethral orifice when there is exertion or pressure on the abdomen such as during sneezing, coughing, laughing, or exercise [6]. This is a condition which not only seriously impacts women's quality of life, but also can cause psychological and social problems such as depression [7], social isolation, reduced self-confidence, family disharmony, and other related health issues, making this one of the most important chronic diseases affecting public health. Pregnancy and delivery are generally considered to be independent risk factors for SUI [8, 9], and the prevalence of SUI gradually increases with the increasing number of pregnancies and deliveries. During pregnancy, fetal enlargement and the increasing weight of the fetus and uterus increases the pressure on the pelvic floor muscles, leading to relaxation of the tissues supporting the pelvic floor and an increase in the incidence of postpartum SUI. In the United

States, the prevalence of SUI is 9.7% in primiparous women, 16.3% in those with a history of two deliveries and increases to 23.9% in those with more than three deliveries, compared to 6.5% in nulliparous women [10]. Stadnicka et al. [11] reported that urinary incontinence occurs in one in six women in the time of 3 to 6 months after labor.

The prevalence and incidence of postpartum UI have been extensively studied. However, the prevalence and/or incidence data vary widely across published studies. In our study, we found that the prevalence of SUI among 6,302 postpartum women in Jiangsu Province was 25.06%, with 26.04% in the eutocia group and 23.51% in the cesarean group. The prevalence of postpartum SUI was reported to be approximately 13.3% in a meta-analysis, from Sweden (26.6%), China (21.2%), Norway (16.4%), the United States (15.8%), India (1.1%), France (3.9%), Canada (3.2%), Thailand (1.5%), Egypt (1.5%), Spain (1.3%), Ireland (1.2%), Italy (0.9%), Denmark (0.8%), United Kingdom (0.7%), Netherlands (0.5%), and Iran (0.4%), respectively [12]. The reason for the difference may be related to our sample, where we selected women who were 6–8 weeks postpartum. The incidence of postpartum UI varies with the postpartum time. Thom et al. [13] reported that nearly 1/3rd of women develops SUI within 3 months postpartum.

Age and weight are widely accepted risk factors for SUI, and the prevalence of SUI increases with age. In a Chinese study, the prevalence of female UI was found to increase with age, from 7.6% at 20–29 years, 19.6% at 20–39 years, 35.1% at 40–49 years, 45.1% at 50–59 years, to 64.8% at ≥ 90 years [14]. Our study findings were consistent with this, and there was a significant increase in the age of patients in the SUI group compared to the non-SUI, with the same findings in the multifactorial analysis. The incidence of SUI was higher in the obese population than in those of normal weight [15]. We got similar findings in our previous study among nulliparous women [16]. Maintaining appropriate weight has a protective effect on the occurrence of UI in both non-multipara and multipara.

There are many studies on SUI and obstetric factors, mainly focusing on the mode of delivery, parity, fetal weight, and week of gestation of delivery. The incidence of UI is lower in cesarean delivery than in vaginal delivery [17–21], and the findings in this study are consistent with literature, where we found that the prevalence of SUI was 23.51% in the cesarean group compared with 26.04% in the normal delivery group. There was a higher rate of normal delivery in the SUI group (63.52% vs 60.32%, $p = 0.024$). Wang et al. [8] concluded that elective cesarean delivery did not completely prevent the occurrence of postpartum SUI. With more research, increasingly, experts are not recommending elective cesarean delivery solely to prevent the occurrence of postpartum SUI. The prevalence of SUI

increases with increasing parity [21]. Our study findings are consistent with this, where the prevalence of postpartum SUI with a history of two deliveries was 28.50% compared to 23.31% among those with a history of one delivery, and this difference was statistically significant. There are inconsistent findings with respect to fetal birth weight and SUI. Jiejun et al. found that fetal weight > 3 kg was associated with the occurrence of SUI in a risk factor analysis of 612 primiparous women with SUI [22]. But in the present study, there was no significant correlation between the occurrence of SUI and fetal weight, which was consistent with the results of an earlier systematic analysis [12].

Postpartum women are prone to pelvic organ prolapse due to pelvic floor muscle laxity, chronic constipation, premature labor, and exercise, which significantly correlated with UI. Studies have reported that up to 54% of women with pelvic organ prolapse (POP) also got SUI [23]. In this study, we found a statistically significant increase in the proportion of women with SUI with coexisting POP compared to that in the non-SUI group.

Diastasis recti abdominis refers to stretching and thinning of the abdominal white line, causing the separating of the two otherwise parallel and juxtaposed rectus abdominis muscles from their position at the abdominal white line, and a gap of more than 2 cm suggests diastasis recti abdominis. The reason for this is that the hormonal changes in the body of women during pregnancy lead to changes in the elasticity of the connective tissue to facilitate fetal development and delivery, leading to muscle relaxation at the white line of the abdomen and weakening of the connecting force. In addition, intrauterine fetus growth, displacement of the abdominal organs, and a gradual increase in the mechanical pressure on the abdominal wall all stretch and thin the abdomen white line, loosening the rectus abdominis muscle and increasing the gap. However, the prevalence of diastasis recti abdominis varies widely, depending on different detection methods and diagnostic criteria. The prevalence of diastasis recti abdominis at 6–8 weeks postpartum, as reported, is 34.84% to 60% [24, 25]. Opinion is divided as to the association of diastasis recti abdominis with the prevalence of postpartum SUI. However, in our study, we observed a higher prevalence of diastasis recti abdominis in the SUI group than that in the non-SUI group. This may be because of a synergistic effect between the abdominal muscles and the pelvic floor muscles, where weaker abdominal muscles affect the dynamics of the thoracic, abdominal, and pelvic cavities, resulting in the force of the thoracoabdominal diaphragm acting not only on the sacrococcygeal area but also on the pelvic floor muscles, and altered synergistic effect could potentially lead to SUI. Another possible explanation for the high prevalence in our study is that we used a ruler to measure diastasis recti abdominis, which is not precise enough. The sample size needs to be

increased subsequently to accurately measure the diastasis recti abdominis using ultrasound and investigate further whether the diastasis recti abdominis is associated with SUI.

The most used clinical modality for the assessment of pelvic floor function is the electromyographic signal of the superficial and deep pelvic floor muscles, which can indirectly reflect the strength of the pelvic floor muscles by using transvaginal electrodes. These electrodes detect and record the signal value size representing the number of activated motor units, which correlates well with the strength of pelvic floor muscle contractions.[26] The Glazer Protocol is a set of standard programmed quantitative tests for assessment of pelvic floor muscle sEMG. Here, the corresponding pelvic floor electrical signals are collected through a series of activities reflecting the function of type 1 fast twitch and type 2 slow twitch muscle fibers. Type 1 muscle fibers and type 2 muscle fibers play a key role in the supporting structures of the pelvic floor. Decrease in function of type 1 muscle fibers leads to pelvic organ prolapse and persistent urinary leakage, while decrease in muscle strength of type 2 muscle fibers causes a decrease in urinary control, resulting in UI. In the pelvic floor EMG data, the abnormal rate of type I muscle fibre strength, type I muscle fibre fatigue, type II muscle fibre strength and type II muscle fibre endurance in the SUI group reached more than 50%.[27] In this study, both univariate and multifactorial analyses suggested that the level of pelvic floor muscle surface EMG activity was lower in patients with postpartum SUI than that in the postpartum non-SUI group, suggesting reduced contractility and impaired contractile function of the fast and slow muscles in patients with postpartum SUI. In addition, the mean value and variability of pre- and post- baseline rest phase in the postpartum SUI group were found to be lower than those in the postpartum non-SUI group in this study, which may be related to the more relaxed pelvic floor muscles and decreased muscle excitability and activity in postpartum SUI patients.

Although SUI is not life-threatening, it restricts patients' daily life, seriously affects their quality of life, and imposes a huge psychological burden. Pregnancy and delivery are independent risk factors for SUI, with the occurrence increasing significantly with age and being overweight. Selective cesarean delivery can reduce the occurrence of postpartum SUI to some extent. Therefore, the indications for cesarean delivery can be appropriately relaxed for older and overweight mothers. Strengthening maternal health education, maintaining proper weight, and reducing constipation can reduce the occurrence of postpartum SUI.

CONCLUSIONS

In conclusion, the prevalence of postpartum SUI in Jiangsu Province was 25.06% and

was associated with weight (especially being overweight and obesity), moderate labor intensity, frequency of light to moderate exercise, parity, coexisting organ prolapse, constipation, and mean value of endurance contraction phase. Targeted clinical measures should be taken to reduce the occurrence of postpartum UI. This study provides a theoretical basis for effective prevention of postpartum SUI.

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Ethics approval

The study was conducted in accordance with the Declaration of Helsinki(as was revised in 2013). The study was approved by Ethics Committee of the First Affiliated Hospital of Nanjing Medical University (2019-SR-262).

Consent to participate

The written, informed consent was obtained from the participants for the publication.

Availability of data and material

All data generated or analysed during this study are included in this article. Further enquiries can be directed to the corresponding author.

Conflict of interest

All authors declare no conflict of interest.

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Table 1. Overall comparison of the two groups

Variables	N0-SUI (n = 4723)	SUI (n = 1579)	P
Age [years]	28.88 ± 3.88	29.28 ± 3.94	0.000
Weight [kg]	61.25 ± 14.46	61.52 ± 9.23	0.001
BMI [kg/m^2]	23.40 ± 5.50	23.82 ± 3.25	0.004
Fefal weight [kg]	3.37 ± 0.51	3.37 ± 0.55	0.881
Mode of delivery, n (%)			0.024
Vaginal delivery	2849 (60.32)	1003 (63.52)	
Cesarean section	1874 (39.68)	576 (36.48)	
Parity(times), n(%)			0.000
1	3208 (67.92)	975(61.75)	
2	1515 (32.08)	604(38.25)	
Pregnancy week of delivery [weeks], n (%)			0.126
Premature (< 37)	45 (0.95)	23 (1.46)	
Full term (37–40)	4674 (98.96)	1556 (98.54)	
Overdue (> 40)	4 (0.08)	0 (0.00)	
Education degree, n (%)			0.002
Illiteracy	39 (0.83)	24 (1.52)	
Primary school	484 (10.25)	148 (9.37)	
Junior and Senior Secondary	589 (12.47)	205 (12.98)	
Junior college	1493 (31.61)	440 (27.87)	
Undergraduate	1933 (40.93)	677 (42.88)	
Master degree or above	185 (3.92)	85 (5.38)	
Constipation, n (%)			0.000
No-constipation	4056 (85.88)	1164 (73.72)	
Constipation	667 (14.12)	415 (26.28)	
Pelvic of prolapse, n (%)			0.000

No-POP	3083 (65.28)	709 (44.90)	
POP	1640 (34.72)	870 (55.10)	
Diastasis recti abdominis, n (%)			0.010
No- diastasis recti	3669 (77.68)	1177 (74.54)	
Diastasis recti abdominis	1054 (22.32)	402 (25.46)	

SUI — stress urinary incontinence; BMI — body mass index; POP — pelvic organ prolapse

Table 2. Comparison of pelvic floor dysfunction and urinary incontinence quality of life between the two groups

Questionnaires	N0-SUI (n = 4723)	SUI (n = 1579)	p
PFDI-20	8.04 ± 17.34	21.74 ± 25.70	0.000
I-QOL	98.78 ± 3.48	94.70 ± 9.94	0.000

SUI — stress urinary incontinence; I-QOL — incontinence quality of life questionnaire; PFDI-20 — pelvic Floor Distress Inventory-short form 20

Table 3. Pelvic floor EMG parameters of the two groups

Parameters	N0-SUI (n = 4723)	SUI (n = 1579)	p
Mean value of pre-baseline rest phase [μv]	5.71 ± 3.94	5.38 ± 3.76	0.003
Variability of pre-baseline rest phase	0.23 ± 0.23	0.22 ± 0.17	0.083
Maximum value of rapid contraction phase [μv]	36.69 ± 15.65	36.62 ± 15.85	0.876
Rising time of rapid contraction phase [s]	0.45 ± 0.22	0.42 ± 0.19	0.000
Falling time of rapid contraction phase [s]	0.57 ± 0.38	0.54 ± 0.33	0.005
Maximum value of tonic contraction phase [μv]	42.12 ± 18.05	41.46 ± 18.50	0.208

Mean value of tonic contraction phase [μv]	25.83 ± 11.69	25.22 ± 11.97	0.073
Variability of tonic contraction phase	0.24 ± 0.12	0.24 ± 0.09	0.806
Mean value of endurance contraction phase [μv]	22.45 ± 10.75	21.70 ± 10.66	0.016
Variability of endurance contraction phase	4.88 ± 3.67	4.70 ± 3.45	0.081
Mean value of post-baseline rest phase [μv]	0.23 ± 0.21	0.22 ± 0.15	0.094
Variability of post-baseline rest phase	66.15 ± 13.97	65.76 ± 14.05	0.332

SUI — stress urinary incontinence

Table 4. Factors associated with stress urinary incontinence (SUI) in postpartum women

Independent variables	SUI	SUI (unadjusted)			SUI (adjusted)		
	N %	OR	95% CI	P value	OR	95% CI	p
Age							
< 30 (ref)	890 (23.82%)						
31–34	483 (26.69%)	1.16	1.02–1.32	0.021	1.09	0.95–1.27	0.221
35–39	116 (27.95%)	1.24	0.99–1.56	0.063	1.08	0.84–1.40	0.540
40–45	24 (34.29)%	1.67	1.01–2.75	0.044	1.40	0.83–2.37	0.209
BMI							
Normal (18.5–23.9) (ref)	621 (22.56%)						
Underweight (< 18.5)	34 (15.67%)	0.64	0.44–	0.019	0.74	0.50–	0.140

			0.93			1.10	
Overweight (24–27.9)	392	1.27	1.10–	0.001	1.20	1.03–	0.018
	(27.07%)		1.48			1.40	
Obese	526	1.36	1.19–	0.000	1.31	1.13–	0.000
	(28.43%)		1.56			1.50	
Fetal weight							
Normal (2.5–4 kg) (ref)	1369						
	(24.92%)						
Underweight (< 2.5 kg)	61 (28.11%)	1.18	0.87–	0.288	1.25	0.91–	0.168
			1.59			1.73	
Macrosomia (≥ 4 kg)	149	1.02	0.84–	0.876	1.11	0.91–	0.308
	(25.21%)		1.24			1.37	
POP							
Normal (ref)	709						
	(44.90%)						
Abnormal	870	2.31	2.05–	0.000	1.91	1.68–	0.000
	(55.10%)		2.59			2.16	
Diastasis rectiabdominis							
Normal (ref)	1177	1.39	1.04–	0.010	1.06	0.92–	0.394
	(74.54%)		1.36			1.23	
Abnormal	402						
	(25.46%)						
Constipation							
Normal (ref)	1164						
	(73.72%)						
Abnormal	415	2.17	1.89–	0.000	1.83	1.58–	0.000
	(26.28%)		2.49			2.11	
Parity [times]							
1 (ref)	975						
	(61.75%)						
2	604	1.31	1.17–	0.000	1.20	1.04–	0.013
	(38.25%)		1.48			1.39	
Pregnancy week of delivery [weeks]						–	
Premature (< 37) (ref)	23 (1.46%)	0.65	0.39–	0.097	0.50	0.29–	0.012

			1.08			0.86	
Full term (37–40)	1556 (98.54%)	1		0.009			
Overdue (> 40)	0 (0.00%)						
Mode of delivery, n (%)							
Vaginal delivery (ref)	1003 (63.52%)						
Cesarean section	576 (36.48%)	0.87	0.78–0.98	0.024	0.85	0.75–0.96	0.010
Mean value of pre–baseline rest phase [μv]							
Normal (ref)	398 (25.21%)						
Abnormal	1181 (74.79%)	0.88	0.77–1.00	0.062	0.92	0.80–1.04	0.190
Variability of pre–baseline rest phase							
Normal (ref)	1073 (67.95%)						
Abnormal	506 (32.05%)	0.89	0.79–1.00	0.062	0.91	0.79–1.05	0.201
Maximum value of rapid contraction phase [μv]							
Normal (ref)	362 (22.93%)						
Abnormal	1217 (77.01%)	1.13	0.99–1.29	0.075	1.07	0.93–1.24	0.347
Mean value of tonic contraction phase [μv]							
Normal (ref)	334 (21.15%)						
Abnormal	1245 (78.85%)	0.97	0.85–1.12	0.693	1.02	0.88–1.19	0.347
Variability of tonic							

contraction phase							
Normal (ref)	584 (36.99%)						
Abnormal	995 (63.01%)	1.10	0.98–1.24	0.100	1.10	0.97–1.25	0.127
Mean value of endurance contraction phase [μv]							
Normal (ref)	336 (21.28%)						
Abnormal	1243 (78.72%)	1.23	1.07–1.42	0.002	1.19	1.02–1.39	0.024
Variability of endurance contraction phase							
Normal (ref)	4 (0.25%)						
Abnormal	1575 (99.75%)	0.92	0.29–2.89	0.885	0.71	0.21–2.37	0.577

OR — objective response; CI — confidence interval; BMI — body mass index; POP — pelvic organ prolapse