

URINARY INCONTINENCE DURING PREGNANCY,  
IN EARLY PUERPERIUM AND IN THE PERIOD AFTER  
LATE PUERPERIUM – SIGNIFICANCE OF THE ISSUE

Teodora Karachorova<sup>✉</sup>, Svetlozar Slavov, Radko Tocev,  
Mariana Tsankova, Ivan Kostov

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**Abstract**

Urinary incontinence (UI) is a condition of involuntary leakage of urine. The first manifestation of UI in women is often during pregnancy, with the predominant type being stress incontinence. For the first time in Bulgaria a retrospective cohort questionnaire study was conducted aiming to determine the frequency, type, severity and risk factors of urinary incontinence during pregnancy, in early puerperium and in the period after late puerperium. The study was performed in two separate groups of patients – 129 women who gave birth in the period April-May 2024, where the information was taken from self-report questionnaire surveys and refers to their pregnancy and early puerperium, and 147 women who gave birth via normal delivery in the period January-March 2024. In the second group the information was taken through PAPI (Pen-and-Paper Personal Interviews) and refers to their condition in the late puerperium. Our cohort study found that women suffer more often from SUI during pregnancy and after the puerperium. Statistically significant risk factors for involuntary leakage of urine were the age of over 35 years, BMI > 30 kg/m<sup>2</sup>, and prior normal birth. Although mild and in a lower percentage moderate urinary incontinence dominates during pregnancy, it has an adverse impact on the psychoemotional state and social life of patients, which requires increased medical interest for early detection of this problem. Based on data from a number of studies and meta-analyses, the main changes that occur in the mother's organism, which are identified as predisposing to the development

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of urinary incontinence are decreased bladder capacity, excess weight gain during pregnancy, impaired connective tissue remodelling, neural injury, weakness of the urethral sphincter, injury to the pelvic muscles and fascial injury. The findings from our scientific study will increase the awareness of healthcare professionals about SUI and contribute to the design of programmes for prevention and subsequent treatment of incontinence starting from its first manifestations, which will ensure a better quality of life for our patients and reduce the risk of occurrence in old age.

**Key words:** urinary incontinence, stress urinary incontinence, pregnancy, puerperium

**Introduction.** Urinary incontinence (UI) is a condition of involuntary leakage of urine. The main types of UI are: stress incontinence, with a characteristic unintentional passage of urine during laughter, sneezing, coughing or physical exertion; imperative incontinence, manifested by unintentional passage of urine, accompanied or immediately preceded by an unstoppable urge to urinate, and mixed incontinence, in which there is an unintentional passage of urine both during exertion and associated with an urge. A rarer type of UI is that from a transfusion, which results in unintentional passage of urine due to overstretching of the bladder. It is due to impaired contractility of the detrusor or an obstruction preventing the evacuation of the bladder contents.

Many women experience their first symptoms of incontinence during pregnancy. Urinary incontinence symptoms resolve in many women after delivery or the postpartum period, but many will have persistent symptoms. Stress urinary incontinence (SUI), is the most common type of urinary incontinence (UI) in pregnant women [1, 2].

During pregnancy, urinary incontinence is reported by 7–60% of women; an average frequency is 31–42% [3]. The prevalence and severity of incontinence increase during the course of pregnancy [4, 5]. The highest incidence of incontinence is noted in the second trimester and, based upon the cumulative rate of new incontinence symptoms, prevalence peaks in the third trimester [5, 6].

The prognosis for women who develop urinary incontinence during pregnancy is generally favourable. For most women with incontinence during pregnancy, symptoms are likely to resolve after delivery. Seventy percent of women with onset of urinary incontinence during pregnancy experience spontaneous resolution of symptoms postpartum [3, 4, 7, 8].

Specifically, within 12 months postpartum, the prevalence drops to 11–23% [3, 4, 7]. Another important impact of pregnancy-related UI is an increased risk of permanent incontinence in the postpartum period or later in life [9].

According to data from the conducted studies it is known to have detrimental effects on quality of life (QoL) in approximately 54.3 % of all pregnant women in four domains: physical activity, travel, social relationships, and emotional health [8]. Patients are often reluctant to initiate discussions about their incontinence

and urinary symptoms due to embarrassment, lack of knowledge about treatment options, and/or fear of surgery. Female urinary incontinence is a common yet undertreated problem globally.

**Materials and methods.** A retrospective cohort questionnaire study was conducted in patients, who gave birth, aiming to determine the frequency, type, severity and risk factors of urinary incontinence during pregnancy, in early puerperium and in the period after late puerperium.

It is important to note that for the first time such a scientific study is being conducted in Bulgaria, where the focus is young patients with involuntary leakage of urine. With the obtained results, we want to seriously engage the attention and help to overcome therapeutic inertness in healthcare specialists, who should be more engaged in informing and advising pregnant women about this issue. This, in turn, will help pregnant women to understand in detail the essence of the problem and improve their quality of life by timely implementation of effective preventive measures.

A retrospective cohort study was performed in two individual groups of patients: The first group included 129 women who gave birth in the period April-May 2024. The information is taken from self-report anonymous questionnaires and refers to their pregnancy and early puerperium. The second group included 147 women who gave birth in the period January-March 2024. The information was taken through PAPI (Pen-and-Paper Personal Interviews) and refers to their condition in the late puerperium. Statistical data processing was carried out with the software product IBM SPSS Statistics 26. All patients included in the study completed an informed consent form for their participation. Both groups were approved for the conduct of this study by the ethics committee of the respective medical institution.

The focus of the first group of questions is on the general characteristics of the patient, features of pregnancy, mode of birth, weight of the newborn. The focus is on whether the patient suffered from incontinence before becoming pregnant or it appeared during pregnancy.

The second part of the questions that determine the type and severity of incontinence are based on a unified international questionnaire called International Consultation on Incontinence Modular Questionnaire – Urinary Incontinence Short Form (ICIQ-UI SF), adopted by the International Advisory Council on Urology diseases, in 1998.

The final third part of the questions is aimed at determining whether there are still episodes of incontinence after birth, whether they, if any, have impact on the psycho-emotional state, and whether the patients shared their problem with the doctor who was tracking the pregnancy. The subject of interest on our part is the extent to which the patients are familiar with exercise and physiotherapy as a means of treating stress incontinence and their attitude to these methods.

**Results.** We established that in the first group of 129 women who gave

birth in the period April-May 2024 (notionally named “pregnancy group”), 32% or 41 women had incontinence episodes during pregnancy, with 68% of the women experiencing stress incontinence. In 54% of the women in the group, incontinence was moderate in severity.

The study group of women we divided by age up to and over 35 years, showing that the group over 35 years of age had a higher, statistically significant, risk of developing incontinence during pregnancy – in numerical terms, half of those over 35 years of age had incontinence (16 women out of 31).

On a weight basis, we found that obese patients had a higher risk of unintentional urine passage during pregnancy, where in BMI over 30 kg/m<sup>2</sup> – 41% had UI, and 25% were without UI episodes.

Of the first study group of women, 32% had a previous normal birth, where

T a b l e 1  
Risk factors of urinary incontinence during pregnancy

|                          | Total,<br><i>n</i> = 129 |       | Pregnant<br>with UI, <i>n</i> = 41 |              | Pregnant<br>without UI, <i>n</i> = 88 |              | <i>P</i> | Differ-<br>ence |
|--------------------------|--------------------------|-------|------------------------------------|--------------|---------------------------------------|--------------|----------|-----------------|
|                          | <i>N</i>                 | %     | <i>N</i>                           | %            | <i>N</i>                              | %            |          |                 |
| Age                      |                          |       |                                    |              |                                       |              |          |                 |
| < 35                     | 98                       | 76%   | 25                                 | 61%          | 73                                    | 83%          | 0.007    | yes             |
| ≥ 35                     | 31                       | 24%   | 16                                 | <b>39%</b>   | 15                                    | <b>17%</b>   |          |                 |
| BMI                      |                          |       |                                    |              |                                       |              |          |                 |
| Normal<br>(18.5–24.99)   | 34                       | 26.4% | 9                                  | 22.0%        | 25                                    | 28.4%        | 0.047    | yes             |
| Overweight<br>(25–29.99) | 56                       | 43.4% | 15                                 | 36.6%        | 41                                    | 46.6%        |          |                 |
| Obese (> 30)             | 39                       | 30.2% | 17                                 | <b>41.5%</b> | 22                                    | <b>25.0%</b> |          |                 |
| Type of previous birth   |                          |       |                                    |              |                                       |              |          |                 |
| No previous birth        | 39                       | 30.2% | 9                                  | 22.0%        | 30                                    | 34.1%        | 0.043    | yes             |
| PN                       | 42                       | 32.6% | 19                                 | <b>46.3%</b> | 23                                    | <b>26.1%</b> |          |                 |
| CS                       | 48                       | 37.2% | 13                                 | 31.7%        | 35                                    | 39.8%        |          |                 |
| Urinary tract infections |                          |       |                                    |              |                                       |              |          |                 |
| Yes                      | 10                       | 7.8%  | 2                                  | 4.9%         | 8                                     | 9.1%         | 0.013    | yes             |
| No                       | 111                      | 86.0% | 31                                 | 75.6%        | 80                                    | 90.9%        |          |                 |
| No answer                | 8                        | 6.2%  | 8                                  | 19.5%        | 0                                     | 0.0%         |          |                 |
| Constipation             |                          |       |                                    |              |                                       |              |          |                 |
| Yes                      | 24                       | 18.6% | 10                                 | 24.4%        | 14                                    | 15.9%        | 0.002    | yes             |
| No                       | 95                       | 73.6% | 22                                 | 53.7%        | 73                                    | 83.0%        |          |                 |
| No answer                | 10                       | 7.8%  | 9                                  | 22.0%        | 1                                     | 1.1%         |          |                 |
| UI before pregnancy      |                          |       |                                    |              |                                       |              |          |                 |
| Yes                      | 12                       | 9.3%  | 11                                 | 26.8%        | 1                                     | 1.1%         | 0.002    | yes             |
| No                       | 110                      | 85.3% | 25                                 | 61.0%        | 85                                    | 96.6%        |          |                 |
| No answer                | 7                        | 5.4%  | 5                                  | 12.2%        | 2                                     | 2.3%         |          |                 |

46.3% had UI and 26.1% had no UI manifestations. Based on parity and mode of birth, we can conclude that women who have a previous normal birth have a higher risk of urinary incontinence in subsequent pregnancies compared to primiparae.

We found a negative predictive value for the occurrence of UI during pregnancy, in the absence of risk factors, such as urinary tract infections, frequent episodes of constipation, and in patients who already had this problem before they became pregnant (Table 1).

T a b l e 2

Presenting complaints of urinary incontinence and their severity compared to the gestational age

|                  | Total with UI |       | Mild UI  |              | Moderate UI |              | Statistically significant difference |                           |                           |
|------------------|---------------|-------|----------|--------------|-------------|--------------|--------------------------------------|---------------------------|---------------------------|
|                  | <i>N</i>      | %     | <i>N</i> | %            | <i>N</i>    | %            | $\chi^2$                             | SHT                       | <i>t</i> -test            |
| First trimester  | 5             | 12.2% | 0        | 0.0%         | 5           | 22.7%        | <b><i>P</i> &lt; 0.05</b>            | –                         | –                         |
| Second trimester | 11            | 26.8% | 4        | 21.1%        | 7           | <b>31.8%</b> |                                      | <b><i>P</i> &gt; 0.05</b> |                           |
| Third trimester  | 25            | 61.0% | 15       | <b>78.9%</b> | 10          | 45.5%        |                                      | <b><i>P</i> &lt; 0.05</b> |                           |
| Total            | 41            | 100%  | 19       | 100%         | 22          | 100%         |                                      |                           |                           |
| Average GW       | 26.4          |       | 29.7     |              | 23.6        |              | –                                    | –                         | <b><i>P</i> &lt; 0.05</b> |

Data show that 78.9% of women with mild UI had their first onset of complaints in the third trimester of pregnancy, and 31.8% of women with moderate UI had complaints in the second trimester (Table 2). Of the group of studied pregnant women – 9 of them or 22%, remained with persistent incontinence after birth, in early puerperum, with 7 of them being moderate in severity. From here, it can be concluded that moderate incontinence occurs earlier in pregnancy and has a higher risk of persisting after birth (Table 3).

We found that only 34% of the first study group reported the problem to the physician monitoring the pregnancy; 41% were aware that preventive measures and subsequent treatment through exercise and physiotherapy are possible, but only 39% had a positive attitude to these methods of influencing the condition.

T a b l e 3

Severity of urinary incontinence after birth

|       | Total with UI |              | Mild UI  |       | Moderate UI |       | Statistically significant difference |
|-------|---------------|--------------|----------|-------|-------------|-------|--------------------------------------|
|       | <i>N</i>      | %            | <i>N</i> | %     | <i>N</i>    | %     | $\chi^2$                             |
| Yes   | 9             | <b>22.0%</b> | 2        | 10.5% | 7           | 31.8% | <b><i>P</i> &lt; 0.05</b>            |
| No    | 32            | 78.0%        | 17       | 89.5% | 15          | 68.2% |                                      |
| Total | 41            | 100%         | 19       | 100%  | 22          | 100%  |                                      |

In the second study group (notionally named “after delivery”), of the 147 women who gave vaginal birth in the period January-March 2024, we found that 16% or 24 women had episodes of incontinence after delivery. In 63% it is moderate in severity, and 50% have stress incontinence. In this group, age dependence was again established, with the average age of patients with incontinence being 34 years, compared to those without complaints – 31 years. In terms of BMI, we do not establish statistically significant relationship, and in terms of parity, as a risk factor, it is observed that women with one or more previous normal births have a higher incidence of incontinence – 66.7%, compared to primiparae – 33.3%. We found no correlation between the weight of the newborn and the presence of incontinence (Table 4).

T a b l e 4  
Risk factors for urinary incontinence after delivery

|                                    | Total, $n = 147$ |       | Postpartum<br>with UI,<br>$n = 24$ |              | Postpartum<br>without UI,<br>$n = 123$ |       | $P$                             | Difference |
|------------------------------------|------------------|-------|------------------------------------|--------------|----------------------------------------|-------|---------------------------------|------------|
|                                    | $N$              | %     | $N$                                | %            | $N$                                    | %     |                                 |            |
| Age                                |                  |       |                                    |              |                                        |       |                                 |            |
| < 35                               | 111              | 76%   | 14                                 | 58.3%        | 97                                     | 78.9% | <b>0.032</b>                    | yes        |
| ≥ 35                               | 36               | 24%   | 10                                 | 41.7%        | 26                                     | 21.1% |                                 |            |
| Average age                        | 31.8             |       | <b>34.2</b>                        |              | <b>31.4</b>                            |       | <b><math>P &lt; 0.05</math></b> | <b>yes</b> |
| BMI                                |                  |       |                                    |              |                                        |       |                                 |            |
| Normal<br>(18.5–24.99)             | 47               | 32%   | 6                                  | 25%          | 41                                     | 33%   | 0.591                           | no         |
| Overweight<br>(25–29.99)           | 66               | 45%   | 13                                 | 54%          | 53                                     | 43%   |                                 |            |
| Obese (> 30)                       | 34               | 23%   | 5                                  | 21%          | 29                                     | 24%   |                                 |            |
| Newborn weight                     |                  |       |                                    |              |                                        |       |                                 |            |
| Very low birth<br>weight (< 2.500) | 6                | 4%    | 0                                  | 0%           | 6                                      | 5%    | 0.447                           | no         |
| Low birth weight<br>(2.500–3.200)  | 60               | 41%   | 8                                  | 33%          | 52                                     | 42%   |                                 |            |
| Normal<br>(3.200–3.800)            | 65               | 44%   | 12                                 | 50%          | 53                                     | 43%   |                                 |            |
| Macrosomia<br>(> 3.800)            | 16               | 11%   | 4                                  | 17%          | 12                                     | 10%   |                                 |            |
| Previous delivery                  |                  |       |                                    |              |                                        |       |                                 |            |
| No                                 | 75               | 51.0% | 8                                  | <b>33.3%</b> | 67                                     | 54.5% | <b><math>P &lt; 0.05</math></b> | yes        |
| Yes                                | 72               | 49.0% | 16                                 | <b>66.7%</b> | 56                                     | 45.5% |                                 |            |
| Total                              | 147              | 100%  | 24                                 | 100%         | 123                                    | 100%  |                                 |            |

The motivation for conducting this study was to analyze to what extent this problem affects the quality of life of patients. We found that more than 50% of the respondents experienced feelings of anxiety, and just as many had an impact on their social life. Although 70% of women were aware that stress incontinence

prevention and subsequent therapy were possible, mainly through exercise, and 71% of them showed interest in subsequent treatment, only 25% reported their problem to the doctor who monitored the pregnancy. These alarming data oblige us to perform a targeted search of presence of incontinence in our patients during pregnancy and after childbirth.

**Discussion.** Stress urinary incontinence (SUI) is a significant public health problem and a variety of risk factors have been investigated, including ageing, obesity, parity, modes of delivery, newborn weight.

Based on data from a number of studies and meta-analyses, we have drawn the following conclusions that during pregnancy changes occur in the mother's organism, which are identified as predisposing to the development of urinary incontinence. Complaints are more frequent when the studied risk factors are combined.

Bladder capacity decreases with pregnancy. The uterine weight is the most important factor affecting frequency throughout the pregnancy. Normal bladder capacity in the first trimester is 410 ml. Bladder capacity in the third trimester reduces to 272 ml in conjunction with increased irritability of detrusor muscles [10].

Excess weight gain during pregnancy may lead to increased pressure, chronic stress and subsequent weakness of the pelvic muscles, which may result in hypermobility of the bladder neck, urethra and failure of the urethral sphincter. Furthermore, excess maternal weight gain may impair blood flow and innervations to the bladder and urethra. LIANG et al. [11] reported that women with a prepregnancy BMI  $> 30 \text{ kg/m}^2$  were at increased risk of developing SUI during pregnancy.

Impaired connective tissue remodelling is typical of pregnancy. During pregnancy, increased synthesis of collagen and elastin contributes to changes in soft tissue biomechanics. Most notably, the vagina becomes more distensible [12]. Collagen changes included both tensile properties and number. Changes in tensile properties contribute to reduced functional support of PFM, and reduced total collagen content may result in joint laxity and stretching of pelvic ligaments [13].

After childbirth, the risk of urinary incontinence is significantly increased due to trauma and subsequent loss of pelvic floor muscles function. During labour and vaginal delivery, descent of the fetal head may cause stretching and compression of the pelvic floor and the associated nerves. This process can lead to demyelination and subsequent denervation [14]. Risk factors for denervation and pudendal nerve damage include operative delivery, prolonged second stage, and high birth weight. Pelvic pressure by the fetal head during the second stage of labour may lead to combined neurovascular injury.

Some patients develop weakness of the urethral sphincter after childbirth. Decreased urethral pressure is found in a large percentage of women with SUI during pregnancy, suggesting weakness of the urethral sphincter in the pathogenesis of stress incontinence [15].

Injury to the pelvic muscles increases the likelihood of stress incontinence. Specifically, distension of the pubococcygeus by the fetal head may result in detachment of the levator muscle from the pubis. Levator avulsion has been observed among 20% of women who have delivered vaginally, but only rarely after cesarean [16]. Imaging studies suggest that forceps delivery further increases risk [17]. Prolonged second stage of labour may also be associated with occult injury to the levator ani. Loss of levator function may lead to widening of the urogenital hiatus and result in pelvic organ descent, bladder-neck and urethral mobility, leading to urethral sphincter incompetence.

One study described paravaginal defects as separation of the endopelvic fascia from its lateral attachment to pelvic side wall [18]. Paravaginal defects are associated with urethral hypermobility and SUI.

Vaginal birth is associated with an increased risk of pelvic floor dysfunction (PFD) development compared with cesarean delivery or nulliparity [19]. However, cesarean delivery does not completely prevent PFDs [3]. The study group of patients were young women, who had not yet achieved their reproductive plans and had mild to moderate stress incontinence.

The majority of therapeutic approaches are aimed at strengthening different components of the urethral support. Initial treatments for most types of incontinence (stress, urgency, or mixed) include lifestyle modifications and pelvic floor muscle exercise. We typically treat with these conservative therapies for six weeks before considering subsequent therapies. Assuming evidence of some progress, it is also reasonable to treat with conservative therapies for up to six months, particularly in obese women who are likely to experience improved bladder control following weight loss. The basic regimen consists of three sets of 8 to 12 contractions sustained for 8 to 10 seconds each, performed three times a day. Patients should try to do this every day and continue for at least 15 to 20 weeks. If the result is unsatisfactory, the next possible modality for influencing the complaints from unintentional passage of urine during pregnancy is a non-ablative Er:YAG laser technology, which is a revolutionary and clinically evaluated method. The non-ablative effect of the laser leads to thermal contraction of the upper layers and mechanical pulling of the deeper structures of the vaginal wall, to remodelling and shortening of collagen fibres by two-thirds of their length, as well as synthesis of new ones – mainly collagen type III. This leads to regression of changes in the qualitative and quantitative composition of collagen, which results in disturbed remodelling of connective tissue. This provides support to the bladder and urethra and restores the normal function of urinary retention [20].

**Conclusion.** From the retrospective cohort questionnaire study conducted, in patients who gave vaginal birth and caesarean section, we found that women suffer more often from SUI during pregnancy and after the puerperium. Statistically significant risk factors for unintentional urine passage were the age of over 35 years, BMI > 30 kg/m<sup>2</sup>, and prior

normal birth. Although mild and in a lower percentage moderate urinary incontinence dominates during pregnancy, it has an adverse impact on the psychoemotional state and social life of patients, which requires increased medical interest for early detection of this problem. There is a need for effective, non-invasive therapeutic intervention and our aim is to raise awareness for urinary incontinence in women during pregnancy and postnatal. The findings of our study will increase the awareness of healthcare professionals about SUI and contribute to the design of programmes for prevention and subsequent treatment of incontinence starting from its first manifestations, which will ensure a better quality of life for our patients and reduce the risk of occurrence in old age.

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*Clinic of Operative Gynecology,*  
*University Obstetrics and Gynecology Hospital “Maichin dom”,*  
*2 Zdrave St, 1463 Sofia, Bulgaria*  
*e-mails: trk95@abv.bg, svetlozarslavov@yahoo.com, rtocev@abv.bg,*  
*drmzankova@medicinabg.com, dr\_kostoff@yahoo.com*