Three most important etiological factors of occurrence of stress urinary incontinence in nulliparous pre- and postmenopausal Polish women

Karolina Chmaj-Wierzchowska1, Beata Pięta1, Magdalena Kotecka1, Michał Michalak2, Stefan Sajdak3, Tomasz Opala1

1 Department of Mother and Child Health, University of Medical Sciences, Poznan, Poland
2 Chair and Department of Computer Science and Statistics, University of Medical Sciences, Poznan, Poland
3 Clinic of Surgical Gynaecology, University of Medical Sciences, Poznan, Poland


Abstract

Introduction: Stress urinary incontinence (SUI) is a chronic disease which occurs in 50% of women with urinary incontinence. It is estimated that in association with a longer life span and ageing of the population, this disorder will become even more prevalent and will exert an increasingly stronger effect on the deterioration of the quality of life.

Objective: The objective of the study is analysis of the factors affecting the occurrence of SUI.

Methodology: The analysis covered 260 patients aged 27-82. The criterion of enrolment into the study was: diagnosis of SUI without disorders of pelvi-genital statics, and negative obstetric history (nulliparous and non-pregnant women). The investigations covered, among other things, the effect surgeries in the area of the lesser pelvis, body mass index (BMI), cigarette smoking, concomitant internal diseases, and hormonal therapy, with consideration of the division into two groups: women before and after menopause. Statistical analysis was performed by means of chi 2 Pearson, t-Student test, and Fisher-Freeman-Halton test for p<0.05.

Results: The results of the analysis unequivocally indicate that the age of patients (p=0.0001), body mass index (BMI) (p=0.0001), and surgical procedure for the removal of the uterus by laparotomy (p=0.0001) exert the greatest effect on the occurrence of SUI in pre- and postmenopausal women. The effect of the remaining etiologic factors is rather controversial.

Conclusion: A comprehensive analysis of risk factors may contribute to the improvement of the results of treatment and quality of life of pre- and postmenopausal patients.

Key words

stress urinary incontinence, etiologic factors, obesity, age, urogynaecology, surgeries

INTRODUCTION

In women, urinary stress incontinence (SUI) is the involuntary loss or leakage of urine from the urethra during increases in intraabdominal pressure, which is not accompanied by the sensation of urinary urgency [1]. Women suffering from urinary incontinence constitute 70-80% of female patients reporting to a physician due to urinary system diseases. The relative frequency of occurrence of SUI is 50% among women with urinary incontinence, and considering the age of patients, in 15-20% of women aged 40-60, on average [2, 3]. It is estimated that in association with a longer life span and ageing of the population, the incidence of this disorder will increase and exert an increasingly greater effect on the decrease in the quality of life of society [1].

The symptoms of SUI statistically more often occur in women who are obese and perform physical work, as well as among those who delivered by the forces of nature. In some patients, the intensification of complaints occurs many years after childbirth, during the menopausal period, and is most probably related with hormonal disorders which lead to decreased tension and relaxation of the muscles and fascia of the pelvic floor [1, 4, 5]. In addition, a long labour, and so-called short and surgical labours terminated by the vaginal route are associated with lesions which may lead to SUI in the future. Less importance is ascribed to the number of childbirths [1, 4, 5, 6, 7]. It is also considered that extensive surgeries in the area of the lesser pelvis, such as colectomy or hysterectomy may lead to SUI by the loss of support of the urinary bladder [8]. Thoroughly collected history taking is usually sufficient to make a correct diagnosis of SUI. Patients report involuntary loss of urine during, e.g. coughing, sneezing, or performing physical activity. Obviously, the patients urinate more frequently, but this is intentional and conscious, because in this way they try to limit the amount of involuntary urination. Usually, involuntary loss of urine on effort is not accompanied by any other symptoms, such as painful urge, pain, and burning sensation in the urethra or polyuria [1, 9]. Considering the variety of the causes of SUI, there are many surgical methods of treatment for this symptom; however, the Burch and sling procedures are the most frequently used.
The objective of the study was the presentation of this difficult clinical problem and the evaluation of the frequency of occurrence of stress urinary incontinence, with consideration of the most frequent risk factor of this disease in the group of nulliparous women before and after menopause, without pelvi-genital statics disorders.

**MATERIAL AND METHOD**

A prospective analysis of medical records was performed of patients aged 27-82 admitted to the Clinic of Surgical Gynaecology, and Mother and Child Health Clinic, the Gynaecological-Obstetric Clinical Hospital at the Medical University in Poznań, during the period January 2008 – December 2010, for diagnostic tests due to urinary incontinence. After medical history taking, the patients had urogynaecological examination performed, followed by the urodynamics test.

The criterion of enrolment into the study was: diagnosis of SUI without pelvi-genital statics disorders, and negative obstetric history (nulliparous and non-pregnant women). Statistical analysis covered 260 patients, with division into two groups: women before and after menopause. The effect was analyzed of, among other things, surgeries in the area of the lesser pelvis, BMI, cigarette smoking, concomitant internal diseases, and hormonal therapy. Statistical analysis was performed by means of chi 2 Pearson test. The p values p<0.05 were considered statistically significant.

**RESULTS**

The results of the analysis performed unequivocally indicate that the age of patients (p=0.0001), body mass index (BMI) (p=0.0001), and surgical procedure of the removal of the uterus by laparotomy (p=0.0001), exert the greatest effect on the occurrence of SUI (Tab. 1). The data show that 84 postmenopausal women (49.41%) had undergone panhysterectomy, while 20% of premenopausal women had undergone surgery for removal of the uterus, only without ovaries, 22.2% of postmenopausal women had surgical procedure performed due to uterine fibroids vs. 38.3% of premenopausal patients, benign ovarian tumours – 34.8% vs. 44.8%, abnormal uterine bleedings – 43% vs. 17.2%, respectively. The effect of other etiologic factors is rather controversial. Cervical surgery procedures were performed in 5.6% of postmenopausal women and 1.4% of those before the menopause, whereas D and C procedures – 6.9% and 5.6%, respectively. The remaining procedures were appendicectomy, cholecystectomy, and thyroidectomy. Hormonal therapy was applied by 38% of premenopausal women, and this was mainly hormonal contraception in the form of oral contraceptive pills, while postmenopausal women took hormonal drugs, and in 32.35% of cases this was oral hormone-replacement therapy.

The entire study group was analyzed from the aspect of concomitant internal diseases. In as many as 82.3% of the women examined an additional internistic problem occurred, apart from SUI. The remaining percentage of patients (17.7%) did not report any additional diseases while medical history taking. The majority of patients among the above-mentioned 82.31%, especially those at an older age, reported a list of several additional health problems: cardiovascular diseases – 17.5% of postmenopausal women and 5.3% of premenopausal women; diabetes – 32% and 2%, respectively; depression or neurosis – 3.72% and 0.53%, respectively; and chronic infections of the urinary tract – 2.7% and less than 1%, respectively. The remaining disorders reported by patients during history taking were classified as 'others', because it was considered that they did not constitute significant data as the factors predisposing to urinary incontinence. Table 2 presents the remaining data.

**Table 1. Most important factors affecting SUI**

<table>
<thead>
<tr>
<th>Age</th>
<th>Before menopause (n=90)</th>
<th>Menopause (n=170)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean±SD</td>
<td>42.73±9.43</td>
<td>57.76±8.78</td>
<td>p&lt;0.0001***</td>
</tr>
<tr>
<td>BMI</td>
<td>standard</td>
<td>56 (61.80%)</td>
<td>59 (34.71%)</td>
</tr>
<tr>
<td>25-29.9</td>
<td>20 (22.47%)</td>
<td>48 (28.23%)</td>
<td></td>
</tr>
<tr>
<td>30-39.9</td>
<td>8 (8.99%)</td>
<td>44 (25.88%)</td>
<td>p&lt;0.0001#</td>
</tr>
<tr>
<td>35-39.9</td>
<td>2 (2.25%)</td>
<td>18 (10.59%)</td>
<td></td>
</tr>
<tr>
<td>&gt;40 giant obesity</td>
<td>4 (4.49%)</td>
<td>1 (0.59%)</td>
<td></td>
</tr>
<tr>
<td>Abdominal hysterectomy</td>
<td>Yes</td>
<td>18 (20.00%)</td>
<td>84 (49.41%)</td>
</tr>
<tr>
<td>No</td>
<td>72 (80.00%)</td>
<td>86 (50.59%)</td>
<td></td>
</tr>
</tbody>
</table>

Level of statistical significance p<0.05 for p* – Chi 2 Persona test, p** – t-Student and p# – test Fishera-Freemana-Haltona

**Table 2. The characteristic of studied population**

<table>
<thead>
<tr>
<th>Level of statistical significance p&lt;0.05 for p* – Chi 2 Persona test and p** – t-Student</th>
<th>Before menopause (n=90)</th>
<th>Menopause (n=170)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>place of residence</td>
<td>large cities &gt;500 thousand</td>
<td>28 (31.11%)</td>
<td>55 (32.35%)</td>
</tr>
<tr>
<td></td>
<td>100 – 500 thousand</td>
<td>18 (20.00%)</td>
<td>16 (9.41%)</td>
</tr>
<tr>
<td></td>
<td>do 100 thousand</td>
<td>15 (16.67%)</td>
<td>30 (17.65%)</td>
</tr>
<tr>
<td></td>
<td>rural area</td>
<td>29 (32.22%)</td>
<td>69 (40.59%)</td>
</tr>
<tr>
<td>age at menarche</td>
<td>mean±SD</td>
<td>13.66±1.46</td>
<td>13.44±1.68</td>
</tr>
<tr>
<td>duration of complaints</td>
<td>up to 5 years</td>
<td>79 (87.78%)</td>
<td>154 (90.59%)</td>
</tr>
<tr>
<td></td>
<td>over 5 years</td>
<td>11 (12.22%)</td>
<td>16 (9.41%)</td>
</tr>
<tr>
<td>internal disorders</td>
<td>Yes</td>
<td>48 (52.22%)</td>
<td>111 (65.29%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>42 (46.67%)</td>
<td>59 (34.71%)</td>
</tr>
<tr>
<td>oral hormone therapy</td>
<td>Yes</td>
<td>38 (40.86%)</td>
<td>55 (32.35%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>52 (57.78%)</td>
<td>115 (67.65%)</td>
</tr>
<tr>
<td>cigarette smoking</td>
<td>Yes</td>
<td>4 (4.44%)</td>
<td>14 (8.24%)</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>86 (95.96%)</td>
<td>156 (91.76%)</td>
</tr>
</tbody>
</table>

Level of statistical significance p<0.05 for p* – Chi 2 Persona test and p** – t-Student
DISCUSSION

Stress urinary incontinence may concern women at various ages, and may be caused by various etiologic factors. Stothers et al. [10] prove that age exerts the most significant effect on the occurrence of urinary problems. Obesity significantly contributes to an increased prevalence of this disorder, and the reduction of body weight is of great importance in alleviation of the SU1 symptoms. Pregnancy, childbirth, and surgical procedures concerning the pelvic fundus may increase the risk of occurrence of SU1 [10, 11, 12, 13, 14]. According to Contreras Ortiz, the etiology of SU1 is still poorly understood, among the main risk factors are age, pregnancy, childbirth and obesity [15]. Considering the above-mentioned report, in the presented study, patients in childbirth and those who were pregnant, were excluded from the statistical analysis because vaginal delivery and length of full term pregnancy may increase the risk of stress urinary incontinence. The analysis of factors which affect the occurrence of SU1 performed in the group of 260 women aged 27-82, unequivocally showed that the age of patients (p=0.0001), body mass index (BMI) (p=0.0001), and surgical abdominal hysterectomy procedures (p=0.0001) had the most significant effect on the occurrence of the symptoms of urinary incontinence. The effect of the remaining etiologic factors was statistically insignificant and rather controversial.

Effect of age on the occurrence of SU1

The 20th century brought about a longer life span and, in consequence, a decrease in the quality of life of the elderly. The age of menopause is unchangeably assessed to be approximately 50. The symptoms of ageing of the urogenital system occur in about 50% of women. Considering the fact that women live statistically longer, one third of their life is during the postmenopausal period [3]. In postmenopausal period, the frequency of occurrence of SU1 increases two-fold. This is due, among other things, to more frequent infections of the urogenital system, decrease in the level of estrogens in the organism, weakening of the walls of the urinary bladder, as well as the muscles supporting urination. The relationship between the function of the urinary system and level of hormones is confirmed by the fact that the cyclic hormonal changes which take place during the menstruation cycle cause changes in the parameters of the urodynamic test (E2 had a negative correlation with the Q-tip test in post-menopause patients). FSH had positive correlations with the post-void residual volume in the uroflowmetry and the voiding and flow times in the pressure-flow study, and a negative correlation with the peak flow rate in the pressure-flow study in pre-menopause women), as well as symptoms on the part of the urogenital system [9]. It is probable that estrogen receptors, to a certain degree, are responsible for the central control of micturition. It is presumed that the functioning of the structures involved in the control of micturition in SU1 may, with age, become less efficient, and become a basis for pharmacotherapy, with the consideration of estrogens [1, 2, 3]. HRT is the standard treatment and should be applied wherever there are no clear contraindications. Estrogens affect the mechanism of urinary continence by increasing the urethral resistance, increased urinary bladder sensitivity threshold, as well as an increase in the sensitivity of alpha receptors of the urethral smooth muscles. The supplementation of the deficiency of sex hormones results in an improvement of subjective symptoms of urinary incontinence, urodynamic and ultrasound parameters. Most frequently, hormone therapy is applied in the form of vaginal globules or gel, which have the advantage of acting locally on the target organs [3, 9].

Considering the above-mentioned information, and the fact that menopause exerts an effect on stress urinary incontinence, this phenomenon has become a primary constant variable for the considerations and analysis of individual factors predisposing to urinary incontinence.

Effect of excessive body weight on the occurrence of SU1

An excessive body weight, i.e. excessively high BMI value, is among risk factors of urinary incontinence – the higher the BMI, the more intensified the symptoms of urinary incontinence. Obesity of the apple-shaped type (abdominal) is conducive. In addition, in obese women, stress urinary incontinence occurs 4-5 times more frequently than in women with a normal body weight [11]. The epidemiology of urinary incontinence in obese women has not been sufficiently recognized. In France, the prevalence of urinary incontinence was about 44%. Obesity, defined by BMI above 30kg/m² (2), was well established as a risk factor (OR between 1.7 – 2.4) [12]. Theoretically, the increase in intra-abdominal pressure that coincides with an increased BMI results in a proportionally higher intravesical pressure, which overcomes urethral closing pressure and leads to incontinence. Obesity may be an important etiologic factor in SU1, but does not influence urodynamic parameters [13]. The analysis performed in the presented study showed that more than a half of the patients had a BMI value exceeding the standard, and a statistically significant relationship was observed between the groups examined (p<0.0001, Fisher-Freeman-Halton). Although the contribution of obesity in the complex etiopathogenesis of the development of urinary incontinence has not been fully recognized, certainly the reduction of body weight often results in the alleviation of symptoms, an improvement with respect to micturition control, and also improvement in the quality of life [14]. This is best evidenced by the fact that the weight loss obtained by a weight reduction diet programme or bariatric surgery, improves urinary symptoms of stress, urge or mixed incontinence [12].

Effect of gynaecological surgical procedures on the occurrence of SU1

Damage to the nerve-muscle structures of the fundus, and stratification of the abdominal pelvic fascia, is the cause of increase in the incidence of urinary incontinence. Undoubtedly, gynaecological surgeries are among the risk factors of stress urinary incontinence. Due to hysterectomy, there may occur loss of the normal fascial and ligamentous support of the urinary bladder, and support by the adjacent organs [15, 16]. Duru et al. [17] analyzed urodynamic outcomes before and after total hysterectomy for benign conditions, and reported if urinary function was changed after hysterectomy. They reported that overall, symptoms of urinary incontinence were significantly reduced after hysterectomy (relative risk [RR] = 1.37, 95% confidence interval [CI] [1.01, 1.84]). The urodynamic diagnosis of detrusor overactivity was significantly reduced after hysterectomy (RR = 1.58, 95% CI [1.16, 2.16]), but there was no significant reduction in the prevalence of urodynamic stress incontinence after hysterectomy (RR = 0.89, 95%
urinary incontinence affects an increasingly larger part of women. Considering the increase in life span, this complaint is even more troublesome enough to cause a considerable decrease in the quality of life of patients with urinary incontinence and their functioning in society. The symptoms may be troublesome enough to cause a considerable decrease in the quality of life of patients and their functioning in society.

CONCLUSIONS

1. Urinary incontinence is a frequent disorder affecting women at the age of both before and after menopause.
2. The symptoms of SUI are most often reported by patients with overweight and obesity.
3. A comprehensive analysis of the risk factors may contribute to an improvement in the results of treatment, and the quality of life of pre- and postmenopausal patients.
4. The authors declare that they have no conflict of interest.

REFERENCES


