JOURNAL OF WOMEN'S HEALTH
Volume 27, Number 12, 2018

DOI: 10.1089/jwh.2018.6935

Prevalence of Stress Urinary Incontinence in Women with Premature Ovarian Insufficiency

Rongrong Tan, MD, Danhua Pu, MD, Jinxiang Cao, MSc, Huan Ge, MD, Xiaoxia Chang, MD, Guihua Ye, MN, and Jie Wu, MD, PhD[1]

Abstract

Background: To determine the prevalence of stress urinary incontinence (SUI) and associated factors in women with premature ovarian insufficiency (POI).
Materials and Methods: The study included 149 patients with POI and 303 control women without POI. Age, body mass index (BMI), gestational history, time since onset of POI, and status of hormone therapy (HT) for POI were recorded.
Results: There was no statistical difference in the mean age, BMI, and parity between the two groups. The prevalence of SUI in the POI group tended to be higher than that in the control group (20.9%, 30/149 vs. 16.2%, 49/303), although not significantly ($p=0.297$). About 41.6% (62/149) of patients with POI received HT. Patients with POI and SUI were older ($p=0.018$) and had higher BMI ($p=0.007$) than women with POI without SUI ($p=0.007$). Compared to nulliparas, primiparas were more likely to have SUI ($p=0.046$). However, SUI developed irrespective of time since onset of oligomenorrhea/amenorrhea or HT use. Furthermore, regression analysis showed that the prevalence of SUI was higher in women 30–39 years of age (odds ratio [OR] = 3.27, $p=0.002$) and older than 40 years (OR = 7.78, $p=0.001$). Primiparas (OR = 2.89, $p=0.001$) and vaginal delivery (OR = 2.58, $p=0.023$) were associated with SUI.
Conclusions: The prevalence of SUI was fairly high among patients with POI, and age, parity, and vaginal delivery were the main risk factors. However, duration of POI and HT use had no effect on SUI. Increasing awareness of the importance of urinary system health in this population will improve the quality of life for these women.

Keywords: stress urinary incontinence, premature ovarian insufficiency, risk factors

Introduction

Premature ovarian insufficiency (POI) is a clinical syndrome defined by the loss of ovarian activity before the age of 40 years and is characterized by menstrual disturbance with elevated gonadotropin and low estradiol levels.[1] Thus, women with POI spend more time in the postmenopausal period than those who undergo menopause later in life. Urinary incontinence (UI) symptoms begin to appear in the menopausal transition period and may worsen over time.[2] Hormonal changes during the menopausal period cause relaxation and decreased tension of pelvic floor muscles (PFMs) and fascia, thereby increasing the prevalence of UI,[3,4] and women with stress urinary incontinence (SUI) have significantly lower circulating estradiol levels than healthy control women.[5] Fertility, bone and cardiovascular health in patients with POI have been widely studied.[1,6,7] However, there has been little research on SUI in this specific population. Despite marked hormonal change, there is no evidence that hormone therapy (HT) is associated with PFMs function in patients with POI.

SUI is the most common type of UI and is defined as uncontrolled loss of urine when bladder pressure exceeds urethral closure pressure due to physical exertion or with sneezing or coughing.[8] The prevalence of SUI has also increased worldwide in recent decades and is currently a major societal health issue.[9] The highest prevalence was reported in Caucasian American women (range, 23%–67%) and the lowest in Singaporean females (4.8%).[10] Predisposing risk factors for SUI are pregnancy, mode of delivery, parity, strenuous physical work, chronic cough, obesity, connective tissue dysfunction, and menopause[11,12.] A recent study indicated that a low estradiol level might have a negative impact on the lower urinary tract and continence mechanism and maybe a risk factor for SUI.[5]

State Key Laboratory of Reproductive Medicine, Department of Obstetrics and Gynecology, The First Affiliated Hospital of Nanjing Medical University/Jiangsu Province Hospital, Nanjing Medical University, Nanjing, China.

Based on the above, the aim of this study was to investigate the prevalence of SUI in patients with POI and evaluate the effect of temporal, individual, and therapeutic factors on SUI in patients with POI.

Methods

This observational study was conducted in the gynecological endocrine clinic of the First Hospital of Nanjing Medical University (Nanjing, China) between January 2016 and August 2017. Written informed consent was obtained from all patients, and the study was approved by the Research Ethics Committee of the First Affiliated Hospital of Nanjing Medical University.

A total of 149 patients with POI and 303 women without POI matched for age, body mass index (BMI), and parity were included in this analysis; they were asked to complete a self-administered questionnaire as part of their evaluation. We defined ''stress'' incontinence as reported leakage with ''coughing, laughing, sneezing, jogging, jumping, physical activity, or lifting an object from the floor.''

The diagnosis of POI is based on a combination of oligomenorrhea/amenorrhea of more than 4 months of duration associated with elevated gonadotropins (follicle stimulating hormone >25 IU/L) on at least two occasions measured 4–6 weeks apart in women younger than 40 years.[13] To ensure homogeneity of the sample, only women with idiopathic POI were included. SUI was defined as leakage or loss of urine caused by sneezing, coughing, exercising, lifting, or physical activity, but without urge symptoms. The exclusion criteria were pregnancy, primary amenorrhea, chromosome abnormalities, multiple pregnancies, neonatal birth weight >4 kg, use of an intrauterine device, vaginal bleeding, previous urogynecologic surgery, autoimmune disease, postmenopausal status, pervious physical therapy for pelvic dysfunction, or a urinary tract infection at the time of assessment.

In all cases, age, BMI, parity, mode of delivery, newborn weight at delivery, time since onset of POI, and use of HT were recorded. To ensure homogeneity of the sample, HT was cyclical when 2 mg of 17β-estradiol was used daily, whereas 10 mg dydrogesterone was used for 14 days of the month. Measurements were performed by an independent investigator who was blinded to the treatment sequence.

Statistical analysis

Data were analyzed using SPSS version 18.0 (SPSS, Inc.). Mean and standard deviation were used for description of variables. Student's *t*-test and the Mann-Whitney test were used for variables in which distribution was not normal. The differences between rates were tested by the chi-square or Fisher's exact tests, if appropriate. Logistic regression analysis was used to determine the associations between the different variables and SUI, and all results were expressed as odds ratio (OR) and 95% confidence interval (CI). p Values of <0.05 were considered significant.

Results

As shown in Table 1, a total of 149 patients with POI and 303 women without POI were recruited for the study. There were no statistical differences in age, BMI, and parity between the POI and control groups. The nominal prevalence of SUI in the POI group was just slightly higher than that in the control group, but the difference was not statistically significant (20.9% vs. 16.2%, $p = 0.297$).

In patients with POI, the age distribution ranged from 21 to 46 years, with the mean (±standard deviation) age being 33.6 (±5.5) years. BMI was 21.8 ± 3.1 (16.3–39.4) kg/m^2. There were 46 nulligravidas, 92 primiparas (parity = 1), and 11 multiparas (parity = 2), and 62 (60.2%) women had a previous vaginal delivery. In total, 62 (41.6%) women with POI received HT. The prevalence of SUI was 20.1% (30/149) in patients with POI. The mean age (35.7 ± 5.0 vs. 33.0 ± 5.5 years, $p = 0.018$) and BMI (25.97 ± 4.17 vs. 26.77 ± 4.26 kg/m^2, $p = 0.007$) in women with SUI were higher than in those without SUI.

When patients with POI were stratified according to age, there were statistically significant differences in the prevalence of SUI between those 21–29 years of age ($n = 38$) and those 30–39 years of age ($n = 96$) or 40–46 years of age ($n = 15$) ($p = 0.026$). Patients with POI 40–46 years of age had

Table 1. Demographic Variables and Prevalence of Stress Urinary Incontinence in the Premature Ovarian Insufficiency and Control Group

Variable	*POI* (N = *149*)	*Control* (N = *303*)	t/χ^2	p *value*
Mean age (years)	33.56 ± 5.49	33.06 ± 5.06	0.90	0.367
BMI (kg/m^2)	21.8 ± 3.06	22.0 ± 2.90	–0.68	0.496
Parity (%)			0.01	0.997
Nulligravidas (parity = 0)	30.9% (46/149)	30.7% (93/303)		
Primiparous (parity = 1)	61.7% (92/149)	61.7% (187/303)		
Multiparous (parity = 2)	7.4% (11/149)	7.6% (23/303)		
Mode of delivery			0.04	0.846
Vaginal delivery	60.2% (62/103)	59.0% (124/210)		
Cesarean section	39.8% (41/103)	41.0% (86/210)		
SUI	20.1% (30/149)	16.2% (49/303)	1.09	0.297
SUI occurrence in age group (years)				
21–29	7.9% (3/38)	7.5% (6/80)	0.00	1.000
30–39	21.9% (21/96)	17.2% (33/192)	0.92	0.337
40–46	40.0% (6/15)	32.3% (10/31)	0.27	0.605

BMI, body mass index; POI, premature ovarian insufficiency; SUI, stress urinary incontinence.

Table 2. Clinical Characteristic of Women with Symptomatic Stress Urinary Incontinence and the Nonstress Urinary Incontinence Group in Premature Ovarian Insufficiency women

Variable	N	*SUI* n *(%)*	*Non-SUI* n *(%)*	χ^2	p *value*
Age (years)				7.35	0.026*
21–29	38	3 (7.9)	35 (92.1)		
30–39	96	21 (21.9)	75 (78.1)		
40–46	15	6 (40.0)	9 (60.0)		
BMI (kg/m^2)				6.42	0.093
<18.5	15	1 (6.7)	14 (93.3)		
18.5–23.9	104	23 (22.1)	81(77.9)		
24.0–27.9	27	4 (14.8)	23 (85.2)		
≥28.0	3	2 (66.7)	1 (33.3)		
Parity				5.32	0.070
Nulligravidas (parity = 0)	46	5 (10.9)	41 (89.1)		
Primiparous (parity = 1)	92	24 (26.1)	68 (73.9)		
Multiparous (parity = 2)	11	1 (9.1)	10 (90.9)		
Mode of delivery				3.44	0.064
Vaginal delivery	62	19 (30.6)	43 (69.4)		
Cesarean section	41	6 (14.6)	35 (85.4)		
Time since POI (months)				1.24	0.265
≤12	47	12 (25.5)	35 (74.5)		
>12	102	18 (17.6)	84 (82.4)		
HT use					
No	87	18 (20.7)	69 (79.3)	0.40	0.841
Yes	62	12 (19.4)	50 (80.6)		

*$p < 0.05$.
HT, hormone therapy.

a higher prevalence of SUI than those 21–29 years of age (40.0% vs. 7.9%, $p = 0.000$; Table 2). As shown in Table 1, the prevalence of SUI in women with POI compared to control in the three age subgroups was 7.9% vs. 7.5%, 21.9% vs. 17.2%, and 40.0% vs. 32.2%, respectively (all not statistically different).

Based on the World Health Organization definition of BMI, the 149 patients with POI were divided into four groups: 15 were considered lean (BMI ≤18.5 kg/m^2), 104 with normal weight (BMI = 18.5–23.9 kg/m^2), 27 were overweight (BMI = 24.0–27.9 kg/m^2), and 3 were obese (BMI ≥28 kg/m^2). There were no significant differences in the prevalence of SUI ($p = 0.093$, Table 2).

The prevalence of SUI in patients with POI did not differ among the groups by parity ($p = 0.070$); however, primiparous women were more likely to have SUI than nulligravidas (26.1% vs. 10.9%, $p = 0.039$, Table 2). Moreover, there was no significant difference in prevalence of SUI between women who underwent normal vaginal delivery and those who underwent cesarean section ($p = 0.064$). Overall, 62 women (41.6%) used HT and 87 women never used HT; however, there was no statistical association with SUI ($p = 0.265$). SUI prevalence also showed no significant correlation with POI duration ($p = 0.841$, Table 2).

As shown in Table 3, logistic regression analysis was used to check for associations between the variables and SUI in patients with POI. Compared to women 20–29 years of age, those 30–39 years of age (OR = 3.27, 95% CI 1.53–7.00, $p = 0.002$) and those older than 40 years (OR = 7.78, 95% CI 2.26–26.80, $p = 0.001$) were associated with a three- to eight-fold increased risk of SUI. Moreover, primigravida history (OR = 2.89, 95% CI: 1.54–5.43, $p = 0.001$) and vaginal delivery (OR = 2.58, 95% CI: 1.14–5.83, $p = 0.023$) were also associated with SUI.

Discussion

SUI affects the quality of life of a large proportion of postmenopausal women.[14] POI occurs at ages <40 years,

Table 3. Risk Factors for Stress Urinary Incontinence

Variable	N	*OR*	*95% CI*	p *value*
Age groups (years)				
21–29	38	Reference		
30–39	96	3.27	1.53–7.00	0.002*
≥40	15	7.78	2.26–26.80	0.001*
BMI	149	0.85	0.55–1.32	0.476
Parity				
Nulligravidas (parity = 0)	46	Reference		
Primiparous (parity = 1)	92	2.89	1.54–5.43	0.001*
Multiparous (parity = 2)	11	0.82	0.10–6.86	0.855
Mode of delivery				
Cesarean section	41	Reference		
Vaginal delivery	62	2.58	1.14–5.83	0.023*

*$p < 0.05$.
OR, odds ratio; CI, confidence interval.

which is a decade earlier than the natural menopausal age of 50, and the associated low estrogen levels may have more serious consequences. However, no previous report has evaluated the incidence of SUI and associated factors in patients with POI.

The overall proportion of women with SUI in association with POI was 20.1% (30/149) in this study, which tended to be higher than in the control group (16.2%, 49/303), but not significantly. This study also suggested that women with SUI were significantly older and had higher BMI than the control women. Furthermore, primiparas were more likely to be at risk for SUI than nulliparas.

In other studies, the prevalence of SUI has been variable depending on age, race, and geographic region. Ng et al.[15] reported a prevalence of SUI of 37.5% in women 30–50 years of age in Macau, China. In this study, the prevalence of SUI was 16.2% in the control group, which is consistent with the results of an epidemiological study conducted by Zhu et al.,[16] who reported that the overall prevalence rate of SUI was 18.9% in Chinese women. In patients with POI, the occurrence of SUI at 21–29, 30–39, and 40–46 years of age was 7.9%, 21.9%, and 40.0%, respectively. These rates were not significantly different in the POI group and in the control group, in which the prevalence of SUI was 7.5% in those 20–29 years of age, 17.2% in those 30–39 years of age, and 32.3% in those 40–49 years of age. In addition, the prevalence of SUI (28.2%) peaked in the group of women 50 years of age (about the average natural menopausal age[17]) in a nationwide prevalence study.[16] Our study found that SUI is 7.78 times more common in women older than 40 years than in younger women. These results suggested that age had a strong association with SUI in patients with POI.

Pregnancy and vaginal delivery are the generally accepted independent risk factors for SUI. Pregnancy-related hormonal and mechanical factors can expose women to an increased risk of SUI. The prevalence rate was 5.6% in nulliparous women, and it increased to 9.5% after one delivery and was 21.8% after two or more deliveries.[18] Our study showed that 26.1% of primiparas had SUI. In comparison with nulliparas, primiparas were 2.89 times more likely to have SUI. After a single vaginal delivery, middle-aged women have an approximate increase of 12% in the prevalence of UI compared with those who undergo a single caesarean section.[19] The prevalence of SUI increased to 30.6% in patients with POI in this study. However, the difference according to vaginal delivery vs. cesarean section was not significant.

Obesity is also frequently mentioned as a risk factor for SUI. Subak et al.[20] demonstrated that every 5-U increase in BMI was associated with a 20%–70% increase in UI risk. In this study, patients with POI and SUI had a significantly higher BMI (23.1 ± 4.0 vs. 21.4 ± 2.7, $p = 0.007$) than those with POI without SUI. However, the prevalence of SUI was not significantly different among the four BMI groups, possibly because the number of obese ($n = 27$) and overweight ($n = 3$) patients with POI was small.

Epidemiological studies have implicated estrogen deficiency in the etiology of lower urinary tract symptoms, with 70% of women relating the onset of UI to their final menstrual period.[21] The effect of menopausal HT on UI symptoms remains unknown. Local administration of estrogen improves symptoms of incontinence, whereas the effect of systemic HT remains unclear.[22] The Women's Health Initiative study reported that women receiving HT had a higher risk of developing SUI.[23] Our study discovered that neither time from onset of oligomenorrhea/amenorrhea nor HT use had an effect on SUI incidence in patients with POI. It is noteworthy that the duration of HT use was relatively short in this study. Cody et al.[24] reported that the route of HT had different effects, as oral systemic estrogen worsened incontinence, while vaginal estrogen improved incontinence. One possible explanation for the different clinical results could be that the distribution of estrogen receptors in the bladder and pelvic floor changes according to different menopausal stages, with different responses to exogenous estrogen therapy.

It is important to note that although PFM training is considered the first-line treatment for SUI,[25] few women in this study were aware of and sought medical care for SUI. Besides being embarrassed, most women believed that UI was a natural consequence of aging and giving birth.[10]

This study had some limitations, such as the small study sample size, age distribution, and HT regimen. All data were self-reported by study participants rather than a formal diagnosis, potentially causing results to be influenced by recall bias. The precision in some comparisons was limited. Therefore, larger and more comprehensive studies are required to confirm these results, so that they may be generalized to other women with POI. Despite these limitations, this clinical study is the first to examine SUI in women with POI.

Conclusions

Although this study does not support an association between SUI and POI, it is imperative that this association continues to be investigated. Age, primiparity, and vaginal delivery were strong risk factors for SUI, whereas the duration of POI and HT use had no effect on SUI incidence. Furthermore, the results highlight the importance of changing perceptions about SUI to achieve a better quality of life for patients with POI.

Acknowledgments

We thank all the subjects for their participation in this research, as well as the clinical coworkers from the Department of Women's Healthcare. This work was supported by the (National Natural Science Foundation of China); under Grant (number 81601252); and the Priority Academic Program for the Development of Jiangsu Higher Education Institutions.

Author Disclosure Statement

All authors have fulfilled the conditions required for authorship and have no competing financial interests to declare. All authors have reviewed the final version of the article.

References

1. ESHRE Guideline Group on POI, Webber L, Davies M, et al. ESHRE Guideline: Management of women with premature ovarian insufficiency. Hum Reprod 2016;31: 926–937.
2. Mishra GD, Cardozo L, Kuh D. Menopausal transition and the risk of urinary incontinence: Results from a British prospective cohort. BJU Int 2010;106:1170–1175.

3. Tosun ÖÇ, Mutlu EK, Tosun G, et al. Do stages of menopause affect the outcomes of pelvic floor muscle training? Menopause 2015;22:175–184.
4. Mannella P, Palla G, Bellini M, Simoncini T. The female pelvic floor through midlife and aging. Maturitas 2013;76: 230–234.
5. Bodner-Adler B, Bodner K, Kimberger O, et al. Role of serum steroid hormones in women with stress urinary incontinence: A case–control study. BJU Int 2017;120:416–421.
6. Baber RJ, Panay N, Fenton A, IMS Writing Group. 2016 IMS recommendations on women's midlife health and menopause hormone therapy. Climacteric 2016;19:109–150.
7. Hamoda H, British Menopause Society and Women's Health Concern. The British Menopause Society and Women's Health Concern recommendations on the management of women with premature ovarian insufficiency. Post Reprod Health 2017;23:22–35.
8. Haylen BT, de Ridder D, Freeman RM, et al. An International Urogynecological Association (IUGA)/International Continence Society (ICS) joint report on the terminology for female pelvic floor dysfunction. Int Urogynecol J 2010;21:5–26.
9. Lang K, Alexander IM, Simon J, et al. The impact of multimorbidity on quality of life among midlife women: Findings from a U.S. nationally representative survey. J Womens Health (Larchmt) 2015;24:374–383.
10. Perera J, Kirthinanda DS, Wijeratne S, Wickramarachchi TK. Descriptive cross sectional study on prevalence, perceptions, predisposing factors and health seeking behaviour of women with stress urinary incontinence. BMC Womens Health 2014;14:78.
11. Sangsawang B. Risk factors for the development of stress urinary incontinence during pregnancy in primigravidae: A review of the literature. Eur J Obstet Gynecol Reprod Biol 2014;178:27–34.
12. Calleja-Agius J, Brincat MP. The urogenital system and the menopause. Climacteric 2015;18(Suppl 1):18–22.
13. Menopause Subgroup, Chinese Society of Obstetrics and Gynocology, Chinese Medical Association. Consensus of hormone replacement therapy for premature ovarian insufficiency. Zhonghua Fu Chan Ke Za Zhi 2016;51:881–886.
14. Augoulea A, Sioutis D, Rizos D, et al. Stress urinary incontinence and endogenous sex steroids in postmenopasual women. Neurourol Urodyn 2017;36:121–125.
15. Ng SF, Lok MK, Pang SM, Wun YT. Stress urinary incontinence in younger women in primary care: Prevalence and opportunistic intervention. J Womens Health (Larchmt) 2014;23:65–68.
16. Zhu L, Lang J, Liu C, Han S, Huang J, Li X. The epidemiological study of women with urinary incontinence and risk factors for stress urinary incontinence in China. Menopause 2009;16:831–836.
17. Li L, Wu J, Pu D, et al. Factors associated with the age of natural menopause and menopausal symptoms in Chinese women. Maturitas 2012;73:354–360.
18. Goldberg RP, Abramov Y, Botros S, et al. Delivery mode is a major environmental determinant of stress urinary incontinence: Results of the Evanston-Northwestern Twin Sisters Study. Am J Obstet Gynecol 2005;193:2149–2153.
19. Hilde G, Stær-Jensen J, Siafarikas F, Engh ME, Brækken IH, Bø K. Impact of childbirth and mode of delivery on vaginal resting pressure and on pelvic floor muscle strength and endurance. Am J Obstet Gynecol 2013;208:50.e1–50.e7.
20. Subak LL, Richter HE, Hunskaar S. Obesity and urinary incontinence: Epidemiology and clinical research update. J Urol 2009;182(Suppl 6):S2–S7.
21. Robinson D, Cardozo LD. The role of estrogens in female lower urinary tract dysfunction. Urology 2003;62(4 Suppl 1):45–51.
22. Ewies AA, Alfhaily F. Topical vaginal estrogen therapy in managing postmenopausal urinary symptoms: A reality or a gimmick? Climacteric 2010;13:405–418.
23. Hendrix SL, Cochrane BB, Nygaard IE, et al. Effects of estrogen with and without progestin on urinary incontinence. JAMA 2005;293:935–948.
24. Cody JD, Jacobs ML, Richardson K, Moehrer B, Hextall A. Oestrogen therapy for urinary incontinence in postmenopausal women. Cochrane Database Syst Rev 2012;10: CD001405.
25. Syan R, Brucker BM. Guideline of guidelines: Urinary incontinence. BJU Int 2016;117:20–33.

Address correspondence to:
Jie Wu, MD, PhD
State Key Laboratory of Reproductive Medicine
Department of Obstetrics and Gynecology
The First Affiliated Hospital of Nanjing Medical University/
Jiangsu Province Hospital
Nanjing Medical University
Nanjing 210029
China

E-mail: wujiemd@126.com