

Prevalence and Risk Factors of Stress Urinary Incontinence Among Perimenopausal Women and Its Influence on Daily Life in Women with Sexual Desire Problem*

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Summary: The prevalence of, and related factors to, stress urinary incontinence (SUI) among perimenopausal Chinese women and its impact on daily life among those women with sexual desire problem in Hubei province were investigated. In this study, 1519 perimenopausal women aged 40 to 65 years were selected from three urban communities in the Wuhan area, and two impoverished, mountainous communities in Hubei province, and followed from April to October 2014. Detailed information about demographic characteristics, menstruation, pregnancy, sexual life and chronic diseases was collected. A cross-sectional survey was carried out following information collection by Chi-square test and multiple logistic regression analysis. Univariate and multivariate logistic regression analysis demonstrated that the potential factors associated with developing SUI were old age (OR=3.4, 95% CI: 1.92–6.04), vaginal delivery (OR=0.623, 95% CI: 0.45–0.87), low income (OR=0.063, 95% CI: 0.40–0.92), atrophic vaginitis (OR=1.4, 95% CI: 1.03–1.80), pelvic organ prolapse (OR=2.81, 95% CI: 1.36–5.80), chronic pelvic pain (OR=2.17, 95% CI: 1.90–4.03), constipation (OR=1.44, 95% CI: 1.07–1.93) and incontinence of feces (OR=3.32, 95% CI: 2.03–5.43). Moreover, the ratio of SUI (33.2%) was higher than the ratio of urgency urinary incontinence (24.1%) or the ratio of mixed urinary incontinence (17.4%), and SUI had a greater impact on daily life among women with decreased sexual desire. In conclusion, SUI is a common disorder affecting over one third of the women surveyed, and has a severe impact on the daily life of perimenopausal women with declined sexual desire. Age, mode of delivery, and monthly income are major risk factors involved in the development of SUI.

Key words: stress urinary incontinence; perimenopause; risk factors; sexual desire

Stress urinary incontinence (SUI) is one of the most common subtypes of urinary incontinence (UI). According to the International Urinary Continence Institution, SUI is defined as involuntary leakage of urine caused by coughing, sneezing, laughing, jumping, or exercise^[1]. The prevalence of SUI is different in some Asian countries. In China, the prevalence of SUI was

found to be 18.9% in women above the age of 20, and 23.6%–28.2% for the age range of 40–69, with a peak of 28.2% among 50–59 years old women^[2]. In South Korea, the prevalence of SUI in adult women is 48.8% and that in 30–44 and 45–59 years old women was 68.9% and 56.4% respectively^[3]. The prevalence of SUI in Japanese women aged 40–49, 50–59 was 31.4% and 52.1% respectively^[4]. Other studies have also shown different levels of SUI prevalence in women in western countries and different parts of the world^[5–8]. Some risk factors previously reported for SUI mainly include age, vaginal delivery, obesity and chronic gynecological diseases^[2–5]. Estimates of annual direct costs of UI in all ages in the United States were \$19.5 billion in 2000, and 34 million individuals affected from UI^[9]. SUI not only places an enormous financial

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and public health burden due to medical interventions, it also negatively impacts women's physical, social and psychological health, and their quality of life, especially during the menopausal transition and postmenopausal period. Among many physiological changes during this phase, the decline of estrogen during menopause can cause the atrophy of urogenital system, leading to the development of UI.

Women usually begin menopause at the age of 40–45, which consists of pre-menopause, perimenopause, and late menopause, and can take up almost one third of their life. With the current increase in the aging population of China, the number of women between the ages of 40–64 has reached 220 million, accounting for 33.9% of the female population. Although there are a number of reports about the prevalence and risk factors of UI in different regions of China^[10–13], studies focused on sexual desire and SUI impact on daily life in Chinese women are scarce in the literature. We previously reported prevalence and risk factors of UI^[14], but this is the first study examining the influence of SUI on women's daily life. Our study was designed to determine the prevalence and risk factors of SUI among menopausal transition women, and its influence on daily life among women with a decline in sexual desire. Our aim is to increase patient awareness, inform health care providers, and to enhance the quality of life for those struggling with SUI through improving health care.

1 MATERIALS AND METHODS

1.1 Participants and Survey Design

From April to October 2014, women aged 40 to 65 years old from three urban communities within Wuhan region, and two impoverished, rural communities in Hubei province were followed using a cross-sectional survey. In Wuhan city, three districts were selected using multi-stage, random sampling, and accordingly, one community health service center within each district was chosen and enrolled: the community health service center on Wansong Street of Jiangnan district, the health center on Luonan Street of Wuchang district, and the Changqing Garden of East-West Lake district. For the rural areas, two out of four impoverished mountainous areas of Hubei Province were randomly selected, with the county hospitals of Hefeng in Wuling mountain area, and Fangxian in Qingba mountain area selected and enrolled. Participants were women undergoing free regular physical examination at that time. Besides gender and age, inclusion criteria were as follows: Han Chinese descent, local residence or permanent residence for more than 10 years, healthy mental and cognitive status, and informed consent. Those who were pregnant or had hysterectomy or bilateral oophorectomy, or breast/thyroid cancer or who

refused to complete the questionnaire were excluded.

A standardized questionnaire adapted from the International Consultation Incontinence Questionnaire-short form (ICIQ-SF)^[1] was administered to women during their free health check visits by well-trained health-care workers through face-to-face inquiry. The questionnaire collected the participants' demographic characteristics (age, height and weight, residence area, income, marital status, etc.), gynecological and obstetric history (status of menstruation, pregnancy history, mode of delivery, pelvic operating history, atrophic vaginitis, chronic pelvic pain and pelvic organ prolapse, etc.) and history of chronic diseases (heart disease, diabetes, arthritis, etc.), level of physical exercise, and defecation. In addition, participants who reported experiencing SUI, were further assessed on the type, rate and severity of UI, by being asked about its frequency and its impact on their daily life. Moreover, data about sexual desire were collected. This survey was approved by the Ethnic Committee of Huazhong University of Science and Technology, and informed consent was obtained from respondents according to the guidelines set forth by the committee.

1.2 Definitions and Evaluation Criteria

UI has been described as “involuntary leakage of urine at an inappropriate time point and in an inappropriate place”^[1], and includes the following three subtypes: (1) SUI, where involuntary leakage of urine is caused by coughing, sneezing, laughing, lifting, or physical activity; (2) urgency urinary incontinence (UUI), where there is a sudden urge to urinate, but there is leakage due to inability to reach the toilet in time; and (3) mixed urinary incontinence (MUI), where at least one stress and one urge symptom has been experienced. Participants in the survey were assigned to each subtype of UI based on their responses to the questionnaire, and the severity of influence on daily life was assigned as not at all, slight, moderate and severe.

Other definitions and categories are as follows:

Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared. Normal, overweighted and obesity BMI were defined as less than or equal to 24.9, between 25 and 27.9, and greater than 28 (kg/m²) respectively. Menstrual cycles were classified into premenopause (regular periods), perimenopause (irregular periods in the past 12 months), or postmenopause (no period for 12 months since their last period). Atrophic vaginitis includes any symptom of vaginal soreness, burning, itching, or painful sexual intercourse. The pelvic organ prolapse (POP) includes anterior and posterior vaginal prolapse, or uterine prolapse in examination by gynecologist. Chronic medical disease was self-reported and was defined if under treatment at the time of the survey.

In addition, the following six questions were

designed to evaluate general concerns in sexual life: (1) What is your current frequency of sexual intercourse? (2) What is the cause of complete cessation in intercourse? (3) Have you experienced a decline in sexual desire? (4) What do you think is the reason for this decline in sexual desire? (5) Have you ever had sexual problems? (6) What help do you seek when you encounter sexual problems?

1.3 Statistical Analysis

In this study, EpiData 3.1 was used to input data and duplicate data entry. SPSS 20 was used for statistical analysis. A Chi square test was used for univariate analysis with $P < 0.05$. Multiple Logistic regression analysis was used for multivariate analysis, and relative risk (OR) and 95% confidence limit (95% CI) were calculated.

2 RESULTS

2.1 Demographic Characteristics of Participants

A total of 1577 women were enrolled in the survey. Fifty-eight questionnaires were excluded due to incomplete information, while 1519 (96.3%) questionnaires were validated. The average age of the 1519 participated women was 49.66 ± 5.57 years. Most of them were in normal BMI range and lived in urban areas. Among them, 51.0% of the participants had regular menstruation, 15.7% were perimenopausal and 33.4% were postmenopausal. 29.8% of the participants had attended only primary school or lower and more than half had physical exercise more than one time per week (table 1).

2.2 Prevalence Rates of Stress Urinary Incontinence

Overall, 504 (33.2%) women had SUI, 366 (24.1%) had UII, and 264 (17.4%) had MUI. The prevalence rates of SUI increased with age and peaked after the age of 60 years (table 2).

Table 1 Demographic characteristics (n=1519)

Characteristics	n (%)
Age (years)	
40–44	282 (18.5)
45–49	508 (33.4)
50–54	432 (28.4)
55–59	197 (13.0)
60–65	100 (6.6)
BMI (kg/m ²)	
<24	1152 (75.8)
24–27.9	319 (21.0)
≥28	48 (3.2)
Education	
Primary school or lower	452 (29.8)
Junior/Senior high school	688 (45.3)
College or higher	379 (25.0)
Monthly income (RMB)	
≤1999	235 (15.5)
2000–3999	574 (37.8)
≥4000	623 (41.0)
Missing	87 (5.7)
Menstrual status	
Normal menstruation	774 (51.0)
Menstrual disorder	238 (15.7)
Menopause	507 (33.4)
Physical exercise	
<1 time per week	555 (36.5)
≥1 time per week	964 (63.5)
Residence	
Rural area	452 (29.8)
Urban area	1067 (70.2)

2.3 Factors Associated with SUI

The univariate analysis revealed that the significant factors associated with SUI included age, monthly income, menopause, menstrual status, number of deliveries, mode of delivery, perineal laceration history, cardiovascular disease, diabetes, arthritis, atrophic vaginitis, gynecological disease,

Table 2 Univariate analysis of factors associated with SUI

Variables	n	SUI		χ^2	P
		Yes n (%) 504	No n (%) 1015		
Age (years)				37.89	<0.001
40–44	282	78 (27.7)	204 (72.3)		
45–49	508	140 (27.6)	368 (72.4)		
50–54	432	157 (36.3)	275 (63.7)		
55–59	197	73 (37.1)	124 (62.9)		
60–65	100	56 (56.0)	44 (44.0)		
BMI (kg/m ²)				3.81	0.149
<24	1152	368 (31.9)	784 (68.1)		
24–27.9	319	116 (36.4)	203 (63.6)		
≥28	48	20 (41.7)	28 (58.3)		
Monthly income (RMB, yuan)				16.7	<0.001
≤1999	235	91 (38.7)	144 (61.3)		
2000–3999	574	152 (26.5)	422 (73.5)		
≥4000	623	223 (35.8)	400 (64.2)		
Missing	87				

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Variables	<i>n</i>	SUI		χ^2	<i>P</i>
		Yes <i>n</i> (%) 504	No <i>n</i> (%) 1015		
Menopause					
No	1012	302 (29.8)	710 (70.2)	15.24	<0.001
Yes	507	202 (39.8)	305 (60.2)		
Menstrual status					
Normal menstruation	774	217 (28.0)	557 (72.0)	20.08	<0.001
Menstrual disorder	238	85 (35.7)	153 (64.3)		
Menopause	507	202 (39.8)	305 (60.2)		
Parity					
0	59	17 (28.8)	42 (71.2)	11.55	0.003
1	1242	393 (31.6)	849 (68.4)		
≥2	218	94 (43.1)	124 (56.9)		
Mode of delivery					
Cesarean section	320	80 (25.0)	240 (75.0)	14.29	<0.001
Vaginal delivery	1140	414 (36.3)	726 (63.7)		
Nullipara	59				
Perineal laceration					
No	554	185 (33.4)	369 (66.6)	3.98	0.046
Yes	586	229 (39.1)	357 (60.9)		
Cardiovascular disease					
No	1435	464 (32.3)	971 (67.7)	8.36	0.004
Yes	84	40 (47.6)	44 (52.4)		
Diabetes					
No	1465	476 (32.5)	989 (67.5)	8.81	0.003
Yes	54	28 (51.9)	26 (48.1)		
Arthritis					
No	1336	430 (32.2)	906 (67.8)	4.94	0.026
Yes	183	74 (40.4)	109 (59.6)		
Sexual desire decline					
No	580	160 (27.6)	420 (72.4)	14.75	<0.001
Yes	863	322 (37.3)	541 (62.7)		
Missing	76				
Atrophic vaginitis					
No	1271	406 (31.9)	865 (68.1)	8.3	0.004
Yes	180	77 (42.8)	103 (57.2)		
Missing	68				
Gynecological disease					
No	535	147 (27.5)	388 (72.5)	12.12	<0.001
Yes	984	357 (36.3)	627 (63.7)		
Chronic pelvic pain					
No	1286	355 (27.6)	931 (72.4)	117.52	<0.001
Yes	233	149 (63.9)	84 (36.1)		
Pelvic organ prolapse					
No	1434	433 (30.2)	1001 (69.8)	102.95	<0.001
Yes	85	71 (83.5)	14 (16.5)		
Constipation					
No	1130	307 (27.2)	823 (72.8)	80.33	<0.001
Yes	389	197 (50.6)	192 (49.4)		
Fecal incontinence					
No	1375	400 (29.1)	975 (70.9)	109.37	<0.001
Yes	144	104 (72.2)	40 (27.8)		
Residence					
Rural area	452	160 (35.4)	292 (64.6)	1.43	0.23
Urban area	1067	344 (32.2)	723 (67.8)		

chronic pelvic pain (CPP), POP, constipation, and fecal incontinence (table 2).

2.4 Multivariate Logistic Regression Analysis of Factors Associated with SUI

The multivariate analysis showed that older age was significantly associated with an increased risk of developing SUI. The risk of SUI had a 3.4-fold increase in women of 60–65 years old, compared with those of 40–44 years old (OR=3.4, 95% CI: 1.92–6.04, *P*<0.001). Participants who underwent cesarean section in comparison with vaginal delivery, were at low risk to develop SUI (OR=0.623, 95%

CI: 0.45–0.87, *P*=0.005). Women who had a monthly income of 2000–3999 yuan RMB were less prone to develop SUI (OR=0.063, 95% CI: 0.40–0.92, *P*=0.018) in comparison with those having ≤1999 yuan RMB monthly income. Those who had atrophic vaginitis (OR=1.4, 95% CI: 1.03–1.80, *P*=0.031), POP (OR=2.81, 95% CI: 1.36–5.80, *P*<0.001), CPP (OR=2.17, 95% CI: 1.90–4.03, *P*<.001), constipation (OR=1.44, 95% CI: 1.07–1.93, *P*=0.017) and incontinence of feces (OR=3.32, 95% CI: 2.03–5.43, *P*<0.001) had an increased risk of developing SUI (table 3).

Table 3 Multivariate logistic regression analysis of risk factors associated with SUI

Characteristics	β	<i>P</i>	OR	OR (95%)
Age (years)				
40–44			1	
45–49	0.053	0.79	1.054	[0.715, 1.553]
50–54	0.305	0.133	1.356	[0.911, 2.018]
55–59	0.383	0.114	1.466	[0.912, 2.357]
60–65	1.226	<0.001	3.406	[1.922, 6.038]
Monthly Income (RMB, yuan)				
≤1999			1	
2000–3999	-0.505	0.018	0.603	[0.397, 0.917]
≥4000	-0.083	0.727	0.92	[0.577, 1.466]
Mode of Delivery				
Vaginal delivery			1	
Cesarean section	-0.473	0.005	0.623	[0.447, 0.869]
Atrophic vaginitis	0.308	0.031	1.361	[1.029, 1.801]
Constipation	0.361	0.017	1.435	[1.066, 1.932]
Chronic pelvic pain	1.017	<0.001	2.166	[1.900, 4.028]
Pelvic organ prolapse	1.033	0.005	2.81	[1.364, 5.792]
Fecal incontinence	1.201	<0.001	3.323	[2.034, 5.428]

*The OR was adjusted for all variables included in table 2. OR: odds ratio; CI: confidence interval

2.5 Impact of SUI with Sexual Desire Decline on Daily Life

1443 (95%) of the 1519 participants responded to the questions about sexual life. Of these, 863 (59.8%) women reported a decline in sexual desire. Among women with decreased sexual desire, the ratio of those suffering from SUI, UUI and MUI was 37.3%, 27.2% and 20.4% respectively (table 4). 322 (37.3%) women who reported both SUI and sexual desire decline, experienced a greater impact on their daily life than those having SUI without sexual desire decline (table 5).

old women, the prevalence of SUI was 33.2%, higher than that of UUI (24.1%) and MUI (17.4%). A large epidemiological study in China had established the prevalence of SUI in women aged 40–69 years at 23.6%–28.2%^[2], while another survey in Shanghai^[13] found the prevalence of SUI in women aged 40–69

Table 4 The ratio of UI subtypes among women with sexual desire decline

Sexual desire decline (n=863)	SUI n (%)	UUI n (%)	MUI n (%)
Yes	322 (37.3)	235 (27.2)	176 (20.4)
No	160 (27.6)	134 (23.1)	91 (15.7)
χ^2	12.05	3.104	5.091
<i>P</i>	0.001	0.078	0.024

3 DISCUSSION

In this cross-sectional survey among 40–65 years

Table 5 Impact on daily life among SUI women with and without sexual desire decline

	<i>n</i>	The degree of impact on daily life		χ^2	<i>P</i>
		No or slight	Moderate or severe		
SUI with sexual desire decline	322	286 (88.8)	36 (11.2)	3.9	0.048
SUI without sexual desire decline	160	151 (94.4)	9 (5.6)		

years to be 19.0%–21.8%, which was lower than that in this study. But our results were close to survey results in Beijing and Hebei, which reported the prevalence of SUI in women aged 40–69 years as 30%–37.2% and 34.9%–31.8% respectively^[11, 12]. In other studies the incidence of SUI was reported as anywhere from 31% to 52%^[3–5]. The prevalence of 33% SUI in our reports matched the less reported number. The wide range of prevalence rates in these studies may be related to the utilization of various definitions, target population, type of the study, age, and other factors. It should also be noted that although one of the limitations of the present study is that characterization of UI subtypes is based only on the participants' self-report, our results are generally consistent with previous data.

Some previous studies have reported the association of age, mode of delivery and obesity with prevalence of SUI^[2–5]. In one study, the risk of SUI was found to be approximately 6 times more common in individuals over the age of 40^[15], and several studies have reported that the prevalence of SUI peaks in the middle and elderly stages. Our study confirmed that the rate of SUI increased with advanced age, especially between 60–65 years, as women 60–65 years are 3.4 times more likely to suffer from SUI compared to woman aged 40–45 years. These results are consistent with some other, but not all, previous studies^[2, 16, 17]. One study found that women who had two vaginal deliveries had a 2.4 times higher risk of suffering from SUI than those who delivered via caesarian section^[18]. Other epidemiological studies from China and Italy have also shown that vaginal delivery increases the risk of SUI, consistent with the results of our study^[2, 19]. The mechanism by which vaginal delivery could change the urethral control structure and contribute to increased risk of SUI still remains unclear, although shortly after vaginal delivery, urethral support and sphincter function seem to be related to SUI^[15]. Although cesarean section is considered a protective factor for UI, more attention should be focused on the prevention and treatment of UI during pregnancy, delivery, and post-partum. However, multiple logistic regression analysis in this study did not confirm the influence of BMI on SUI, even though our previous study had shown BMI as an independent risk factor for UI^[14]. Previous studies from China^[2] and South Korea^[7] reported waist size is a risk for SUI, suggesting that perhaps waist size is a better measure for obesity than BMI.

Interestingly, our study also found income level to be a risk factor for SUI. Compared to low-income and high-income women, middle-income women had the lowest prevalence of SUI, while SUI in high-income women was slightly lower (but not statistically different) than that of low-income women. A possible explanation for this observation could be that a low income, poor standard of living may force women to

choose a career involving strong physical labor, while high-income women may have demanding careers with great stress and pressure. On the contrary, middle-income people who enjoy a relatively high happiness index may have more leisure time, and be more inclined to care about their health, and take positive preventative measures. However, the less number of participants from rural area in our survey could have affected these findings.

A number of different studies have shown that women with SUI seem to be frequently affected by obstetric and gynecological chronic disease. We also found that atrophic vaginitis, CPP, POP, constipation, and fecal incontinence were risk factors associated with SUI, similar to previous studies^[2, 7, 11]. All of these symptoms could be at least partly due to the weakness of pelvic floor muscle as a result of aging, with pelvic floor dysfunction being associated with urinary leakage. Constipation can also increase abdominal pressure and urinary pressure^[17, 20], making it easy for middle-aged and elderly women to leak urine.

Sexual activity is a sensitive topic for Chinese women, especially for more traditional women who avoid discussions on the topic. Our questionnaire included six questions related to sexual behavior, and obtained data about participants' sexual desire for the first time. 1443 (94.5%) of participants answered questions about whether sexual desire was impaired, 863 (59.8%) of whom indicated that their sexual desire had decreased, of whom 322 (37.3%) had SUI. SUI was the most common among the three subtypes of UI in women with decreased sexual desire. It is possible that urinary leakage itself directly impacts sexual intercourse^[21, 22]. Importantly, this study found that for those women suffering from both SUI and sexual desire decline, the impact of SUI on daily life was more severe than those suffering from SUI without sexual desire decline. Although there is minimal research on the impact of SUI on the overall quality of life, this is the first research on its impact on daily life in women who suffer from a decrease in sexual desire. Further, we found that those who had combined SUI and sexual problems most commonly sought help from books (30.9%), the internet (25.5%), and their doctors (14.5%), suggesting that there is a need to improve access to information for these patients.

In conclusion, the prevalence of SUI in perimenopausal women is high, with many risk factors affecting its occurrence, the major three being age, mode of delivery, and monthly income, others are atrophic vaginitis, POP, CPP, constipation and incontinence of feces, atrophic vaginitis. The quality of daily life was affected more negatively in women with SUI and declined sexual desire. This information can be used by health care professionals to further improve the quality of life for women, by strengthening

community education, and implementing preventative measures through improving self-health education and health guidance, which will significantly reduce the burden of medical care for this population.

Conflict of Interest Statement

The authors declare that they have no conflict of interest.

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