

# Prevalence, Risk Factors, and Impact on Life of Female Urinary Incontinence: An Epidemiological Survey of 9584 Women in a Region of Southeastern China

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**Purpose:** To investigate the prevalence, risk factors, and impact on quality of life (QOL) of female urinary incontinence (UI) in a region of southeastern China.

**Patients and Methods:** This cross-sectional study, conducted between June 2022 and March 2023, included 9584 women aged 20–70 years who completed a standardized questionnaire through face-to-face interviews. This sample size represents almost 10% of the population in the target area.

**Results:** The prevalence of female UI was found to be 24.8%, with stress UI being the most common subtype (12.7%), followed by mixed UI (8.0%) and urgency UI (4.1%). Notably, the prevalence of UI increased progressively with age and body mass index (BMI). The study also revealed several risk factors for UI, including urban residence, postmenopausal status, multiple vaginal deliveries, instrumental vaginal deliveries, previous delivery of macrosomia, and prior history of pelvic floor surgery as determined by multi-variate analysis. Furthermore, the study showed that 89.5% of women who reported UI experienced varying degrees of negative impact on their QOL. The incontinence quality of life (I-QOL) scale had an average score of 79.70±19.03, which decreased with increasing severity of UI. Despite the adverse effects on QOL, only 20.6% of women with UI had sought medical help.

**Conclusion:** UI is common among women in the survey area. UI has been observed to have varying degrees of adverse effects on the QOL of those affected, but most of them do not seek treatment for several reasons, highlighting the urgent need for health authorities to develop effective UI intervention strategies.

**Keywords:** female urinary incontinence, epidemiology, prevalence, risk factors, quality of life, Southern Chinese

## Introduction

The International Continence Society (ICS) defines urinary incontinence (UI) as “any complaint of involuntary leakage of urine”.<sup>1</sup> The subtypes of UI are distinguished by the accompanying symptoms, including Stress UI (SUI), which refers to “involuntary leakage of urine on effort or exertion or on sneezing or coughing”, and Urgency UI (UUI), which is “involuntary leakage of urine accompanied by or immediately preceded by urgency”. Women who have both SUI and UUI are diagnosed with mixed UI (MUI). UI can cause significant physical discomfort and psychological distress, such as social isolation and depression, leading to a decrease in the quality of life (QOL) for women and imposing substantial social and economic burdens.<sup>2–4</sup> In the United States, over \$12 billion is spent annually on SUI treatment and nursing care for women.<sup>5</sup> The prevalence of UI among adult Chinese women ranged from 8.7% to 69.8% in a review of 48

published studies,<sup>6</sup> while a large-scale population-based survey showed that the prevalence of UI among women was 30.9%.<sup>7</sup> Based on these statistics and population data from China's National Bureau of Statistics, an estimated 200 million Chinese women suffer from UI.

As previously mentioned, numerous studies have reported on the prevalence of UI in Chinese women; however, the majority of data is dated from a decade ago.<sup>7–11</sup> With the accelerated aging of the Chinese population and changes in various UI risk factors, such as the growing obesity population and declining desire to have children, there may be significant changes in UI prevalence. Moreover, most previous studies focused on the population of northern China,<sup>8–11</sup> which may not accurately represent other regions of China due to the vastness of the country and potential demographic differences between the north, central, and south. Therefore, our study aims to evaluate the prevalence of female UI and its impact on QOL in southeastern China. We also aim to explore the high risk factors associated with UI and the willingness of patients with UI to seek care to provide data to support further policy interventions.

## Methods

### Study Design

This cross-sectional, community-based study was conducted from June 2022 to March 2023 with a large sample size. The study was conducted in Shaxian County, which has a total of 100,117 women aged 20–70 years, according to the 7th National Census in 2020. Exclusion criteria included pregnant women and those who were not clearly conscious.

Our study aimed to include 10,000 women, which would represent 10% of the local population. Women between 20 and 70 years old were enrolled in the study using a multi-stage cluster random sampling method. In the first stage, 4000 women were selected from urban areas, and the remaining 6000 were selected from rural areas, based on the proportion of the population distribution between urban and rural areas. At the second stage, Shaxian County has a total of two streets representing urban areas and ten towns representing rural areas, from which 2000 and 600 people are sampled respectively. In the final stage, based on the principle of simple random sampling, communities under streets and villages under towns were randomly selected by SPSS software. All appropriate women in the selected communities and villages were required to participate in the survey until the target sample size was reached. This survey was conducted in full compliance with the principles of the Declaration of Helsinki and was approved by the Ethical Review Committee of Fujian Maternity and Child Health Hospital (2023KYLLR01045). Before participating in the survey, respondents were required to sign an informed consent form.

### Data Collection

As an integral component of the Fujian Female Pelvic Floor Health Management Centre project, this study was supported by the Fujian Provincial Health Commission and its subordinate administrative units, providing substantial backing to the survey. Therefore, our survey obtained a robust response from general practitioners (GPs) working at primary care institutions in Shaxian County, who served as interviewers. Women from the community or village in the selected area were invited to the local health service stations for face-to-face interviews conducted by GPs. The definitions of obesity and overweight were based on the standards set by the China National Health Commission: underweight ( $<18.5 \text{ kg/m}^2$ ), normal ( $18.5\text{--}23.9 \text{ kg/m}^2$ ), overweight ( $24\text{--}27.9 \text{ kg/m}^2$ ), obese ( $\geq 28 \text{ kg/m}^2$ ).<sup>12</sup> The questionnaire used in this study covered a range of topics, including sociodemographic characteristics, obstetric conditions, and two internationalized self-reported questionnaires on UI in Chinese version: the International Consultation on Incontinence Questionnaire-Short Form (ICIQ-SF) and the Incontinence Quality of Life Questionnaires (I-QOL).<sup>13,14</sup> The ICIQ-SF is a tool that assesses UI in the past four weeks. It comprises four sections, with the first three sections having options assigned different scores, resulting in a total score ranging from 0 to 21. The first section evaluates the frequency of urine leakage, with options ranging from never to all the time. The second section assesses the volume of urine leakage, with options ranging from none to a large amount. The third section measures the impact of UI on the individual's life, with options ranging from not at all to a great extent. The total score of these three sections can be used to determine the severity of UI, with scores of 1–7, 8–13, and 14–21 corresponding to mild, moderate, and severe UI, respectively. The last section of the ICIQ-SF identifies the subtype of UI based on the symptoms experienced during leakage.

Once the presence of UI is confirmed, the QOL is further assessed using the I-QOL scale. The I-QOL scale comprises 22 items, with eight items assessing the restriction of behavior (RB), nine items evaluating the psychosocial impact (PI), and the remaining five items examining social isolation (SI). The total score ranges from 0 to 100, with lower scores indicating lower QOL.

In women with UI, it is essential to inquire whether they are seeking medical help for their condition. If the answer is negative, then one or multiple of the following options should be used to explain why: leakage has little impact on their life, embarrassment, financial distress, perception of UI as a normal part of aging rather than a disease, or low expectations of treatment outcomes.

It is crucial to acknowledge that the skill of interviewers could significantly affect the results of the survey. Hence, we conducted detailed training of the interviewers and standardized the survey procedures before starting the project. In addition, a pilot survey involving 300 participants was carried out to test the feasibility and accuracy of the survey methods before initiating the main survey.

## Statistical Analysis

Statistical analyses were performed using IBM SPSS software version 20.0 (IBM Corporation, New York, USA). Continuous variables were expressed as mean + standard deviation, and differences were compared using Student's *t*-test or analysis of variance test, respectively. Categorical variables were expressed as counts (percentages), and differences were compared using chi-square tests or Fisher exact tests. Multivariate logistic regression modeling was utilized to identify which factors remained independently associated with UI after adjusting for confounders. The statistical significance was set at the 5% level ( $p < 0.05$ ).

## Results

A total of 10,000 women were randomly selected to participate in the survey, out of which 265 declined, resulting in a remarkably high response rate of 97.3%. Another 151 women were excluded from the analysis due to incomplete data. Out of the final 9584 respondents, 2376 reported UI, yielding an overall prevalence of 24.8%. The sociodemographic characteristics of the respondents are summarized in Table 1. The majority of the participants were aged between 40 and 59 years (57.7%), had normal weight (55.9%), were premenopausal (61.9%), resided in rural areas (59.0%), had an educational level lower than senior high school (63.9%), earned a monthly income of less than \$448 (62.4%), and had at least one vaginal delivery (90.4%).

**Table 1** Baseline Characteristics of Participants

	Total, n(%)	UI		P value
		Number	Prevalence(%)	
Age group (years)				< 0.001
20–29	1040(10.9)	112	10.8	
30–39	2076(21.7)	415	20.0	
40–49	2427(25.3)	542	22.3	
50–59	3106(32.4)	928	29.9	
60–70	935(9.8)	379	40.5	
Body mass index (kg/m <sup>2</sup> )				< 0.001
Underweight (<18.5)	1327(13.8)	242	18.2	
Normal (18.5–23.9)	5361(55.9)	1291	24.1	

(Continued)

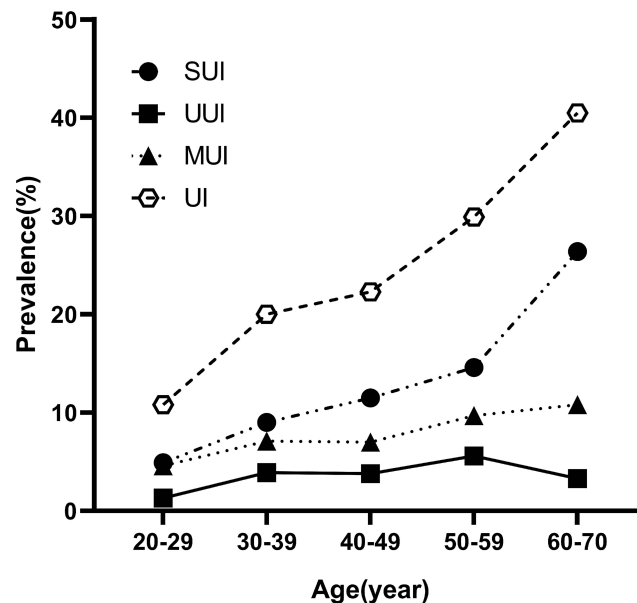
**Table 1** (Continued).

	Total, n(%)	UI		P value
		Number	Prevalence(%)	
Overweight (24–27.9)	2220(23.2)	626	28.2	
Obese ( $\geq 28$ )	676(7.1)	217	32.1	
Menopause				< 0.001
Yes	3655(38.1)	1245	34.1	
No	5929(61.9)	1131	19.1	
Residence				0.001
Urban	3925(41.0)	1042	26.2	
Rural	5659(59.0)	1334	23.6	
Educational status				< 0.001
Primary school or below	2928(30.6)	961	32.8	
Junior high school	3190(33.3)	688	21.6	
Senior high school	1969(20.5)	489	24.8	
College or higher	1497(15.6)	238	15.9	
Personal monthly income <sup>a</sup>				< 0.001
<149	3227(33.7)	932	28.9	
149–448	2752(28.7)	660	24.0	
448–746	2616(27.3)	597	22.8	
746–1493	859(9.0)	159	18.5	
$\geq 1493$	130(1.4)	28	21.5	
Number of vaginal delivery				< 0.001
0	920(9.6)	77	8.4	
1–2	4622(48.2)	1070	23.2	
$\geq 3$	4042(42.2)	1229	30.4	
Prior delivery of macrosomia				< 0.001
Yes	228(2.4)	96	42.1	
No	9356(97.6)	2280	24.4	
Instrumental vaginal delivery				< 0.001
Yes	339(3.5)	125	36.9	
No	9245(96.5)	2251	24.3	
Previous pelvic floor surgery				< 0.001
Yes	152(1.6)	72	47.3	
No	9432(98.4)	2304	24.4	

**Note:** <sup>a</sup>US dollars: According to the exchange rate on January 16, 2023.

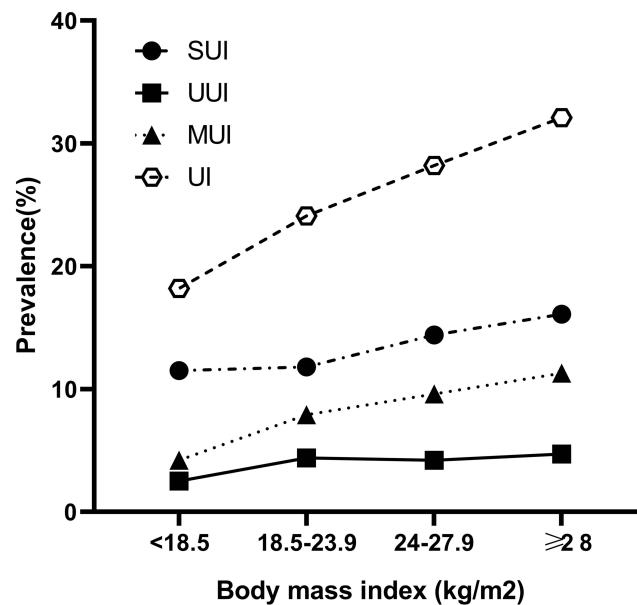
Among the women who reported urinary leakage, SUI was the most prevalent, with a prevalence rate of 12.7%, followed by MUI and UII, with prevalence rates of 8.0% and 4.1%, respectively. The prevalence of SUI increased significantly with age, while the prevalence of MUI and UII did not differ significantly among age groups (Figure 1). We observed that SUI and MUI were more prevalent in overweight and obese women, while the prevalence of UII did not follow this trend (Figure 2).

Details of the ICIQ-SF scale for symptoms of urine leakage are shown in Table 2. 1961 women (82.5%) reported experiencing leakage once a week or less, with the remainder experiencing it 2–3 times a week or more. The amount of leakage was identified as small in 92.2% of these cases, and 62.3% felt that the leakage had mild impact on daily life.



**Figure 1** Prevalence of stress-, urge- and mixed urinary incontinence by age.

**Abbreviations:** SUI, stress urinary incontinence; UII, urgency urinary incontinence; MUI, mixed urinary incontinence; UI, urinary incontinence.



**Figure 2** Prevalence of stress-, urge- and mixed urinary incontinence by body mass index categories.

**Abbreviations:** SUI, stress urinary incontinence; UII, urgency urinary incontinence; MUI, mixed urinary incontinence; UI, urinary incontinence.

**Table 2** Frequency, Amount of Urine Leakage and Impact on Life of Each Subtype of UI

	Total (n=2376)	SUI (n=1215)	UUI (n=393)	MUI (n=768)	P value
Frequency, n (%)					0.001
Once a week or less	1961(82.5)	1045(86.0)	312(79.4)	604(78.6)	
Two or three times a week	284(12.0)	121(10.0)	60(15.3)	103(13.4)	
Once a day	78(3.3)	30(2.5)	15(3.8)	33(4.3)	
Several times a day	43(1.8)	16(1.3)	5(1.3)	22(2.9)	
Always	10(0.4)	3(0.2)	1(0.3)	6(0.8)	
Amount, n (%)					0.001
Small	2190(92.2)	1142(94.0)	363(92.4)	685(89.2)	
Moderate	166(7.0)	69(5.7)	27(6.8)	70(9.1)	
Large	20(0.8)	4(0.3)	3(0.8)	13(1.7)	
Impact on daily life, n (%)					< 0.001
0: not at all	535(23.1)	346(28.5)	34(8.6)	155(20.2)	
1–3: mild	1448(62.3)	685(56.4)	308(78.4)	455(59.2)	
4–6: moderate	285(11.7)	146(12.0)	33(8.4)	106(13.8)	
7–9: severe	81(2.1)	32(2.6)	13(3.3)	36(4.7)	
10: great extent	27(0.8)	6(0.5)	5(1.3)	16(2.1)	

Furthermore, women with MUI suffered more frequent ( $P=0.001$ ) and a larger amount of leakage ( $P=0.001$ ), as well as a more severe impact on QOL ( $P<0.001$ ), compared to SUI and UUI.

Univariate analysis indicated that advancing age, higher BMI, postmenopausal status, urban residence, lower education and income levels, multiple vaginal deliveries, history of macrosomia and instrumental vaginal delivery, and previous history of pelvic floor surgery may be associated with increased prevalence of UI. Further multivariate regression analysis found that all of the above factors, except for low education and income level, were independent factors for UI (Table 3).

Regarding the quality of daily life, the study found that the vast majority of women (89.5%) reported that UI had a negative impact on their QOL to varying degrees. The overall average I-QOL score was  $79.70\pm 19.03$ , which decreased gradually as the severity of UI increased. For mild incontinence, the total I-QOL scores and RB, PI, and SI were similar in women with SUI, UUI, and MUI. For moderate and severe incontinence, women with MUI had significantly lower total I-QOL scores than those with SUI, which was attributed to lower RB and PI scores for MUI than for SUI. Compared to moderate and severe SUI, UUI had a greater impact on behavioral restrictions, while there was no significant difference in PI, SI, and total I-QOL scores. Although total I-QOL scores were slightly lower for moderate and severe MUI than for UUI, this difference was not statistically significant (Table 4).

Only 20.6% of women with UI had sought medical care. The more common reasons for not seeking medical advice were the perception of UI as a normal part of aging rather than a disease (62.3%) and embarrassment (55.8%), the leakage had little impact on their lives (40.5%), and some women did not choose to seek medical help because the financial distress (22.2%) and low expectations of the effectiveness of treatment (38.1%).

**Table 3** Multivariate Logistic Regression Analysis of High-Risk Factors

	OR	95% CI	P value
Age group (years)			
20–29 (ref.)			
30–39	1.390	1.094–1.767	0.007
40–49	1.489	1.171–1.894	0.001
50–59	1.536	1.163–2.028	0.003
60–70	2.331	1.699–3.198	< 0.001
Body mass index (kg/m <sup>2</sup> )			
Underweight (<18.5)	0.662	0.564–0.777	< 0.001
Normal (18.5–23.9)(ref.)			
Overweight (24–27.9)	1.183	1.053–1.329	0.005
Obese (≥28)	1.335	1.114–1.599	0.002
Menopause	1.580	1.322–1.888	< 0.001
Residence			
Rural (ref.)			
Urban	1.670	1.499–1.861	< 0.001
Educational status			
Primary school or below (ref.)			
Junior high school	0.735	0.644–0.839	< 0.001
Senior high	0.960	0.818–1.128	0.623
College graduate or higher	0.727	0.591–0.896	0.003
Personal monthly income			
<149 (ref.)			
149–448	0.902	0.794–1.025	0.114
448–746	0.956	0.828–1.105	0.546
746–1493	0.764	0.618–0.944	0.013
≥1493	0.807	0.518–1.257	0.343
Number of vaginal delivery			
0 (ref.)			
1–2	2.298	1.766–2.989	< 0.001
≥3	2.990	2.285–3.913	< 0.001
Prior delivery of macrosomia	2.270	1.718–2.998	< 0.001
Instrumental vaginal delivery	1.751	1.384–2.215	< 0.001
Previous pelvic floor surgery	2.033	1.457–2.835	< 0.001

**Table 4** Incontinence Quality of Life (I-QOL) Scale and Diagnostic Characteristics

Score, (Mean ± SD)	Type			P value
	SUI	UUI	MUI	
Mild				
Restriction of behaviors	33.75±5.37	33.57±5.97	34.02±5.40	0.279
Psychosocial impact	40.59±5.63	39.68±6.49	40.04±6.12	0.446
Social isolation	21.10±4.12	21.04±4.24	21.32±4.20	0.409
I-QOL	83.45±15.72	82.15±17.81	83.39±16.72	0.385
Moderate				
Restriction of behaviors	29.29±6.60	26.68±6.11 <sup>a</sup>	26.07±7.12 <sup>a</sup>	< 0.001
Psychosocial impact	34.57±8.07	32.60±8.10	31.68±7.17 <sup>a</sup>	0.008
Social isolation	17.12±5.29	16.45±5.97	16.00±4.62	0.239
I-QOL	67.02±20.87	61.05±21.52	58.80±19.85 <sup>a</sup>	0.006
Severe				
Restriction of behaviors	26.89±6.09	19.46±3.67 <sup>a</sup>	19.92±6.00 <sup>a</sup>	< 0.001
Psychosocial impact	29.78±7.65	27.85±6.82	23.08±4.70 <sup>a</sup>	0.001
Social isolation	13.78±5.91	11.38±3.31	11.49±2.54	0.396
I-QOL	55.05±20.88	41.70±14.01	36.45±13.40 <sup>a</sup>	0.002

Note: <sup>a</sup>Compared with SUI, the difference was statistically significant.

## Discussion

In this study of a representative population of southern Chinese women, a high prevalence of urine leakage was reported, with 24.8% of respondents affected. The majority of these women (82.5%) reported experiencing urine leakage once a week or less, and in small amounts (92.2%). SUI was found to be the most common type of incontinence, while SUI and MUI were more prevalent in older women and those with a higher BMI. The study also found that urban residence, postmenopausal status, multiple vaginal deliveries, previous delivery of a macrosomic infant, instrumental delivery, and pelvic floor surgery were all strongly associated with an increased overall prevalence of UI. These findings suggest that targeted interventions focused on these risk factors could be effective in reducing the burden of UI in this population.

However, Akkus et al reported a much higher UI prevalence of 86.7% among 150 women attending gynecologic clinics.<sup>15</sup> The small sample size and highly specific population may have contributed to this extreme prevalence. In addition, differences in UI definitions can also contribute to bias in prevalence estimates. The current study used the ICIQ-SF questionnaire, a validated international standard that focuses on urinary leakage events occurring in the past four weeks, minimizing the possibility of recall errors leading to biased results.

The finding that SUI is the most prevalent type of UI in adult women is consistent with several reports in the literature worldwide.<sup>16–19</sup> We observed a progressive increase in the prevalence of SUI with advancing age, which differs from the findings of Aoki et al who concluded that the prevalence of SUI peaks at the age of 50 years.<sup>20</sup> This discrepancy may be attributed to physiological and structural changes in the urinary tract that occur with advancing age, including reduced contractility of the detrusor. Moreover, older people are vulnerable to COVID-19, and chronic cough after recovery may trigger SUI and exacerbate its symptoms, contributing to the continued increase in SUI prevalence.

Our study also found that higher BMI is strongly associated with SUI development. Overweight and obesity are significantly associated with increased intra-abdominal pressure, which may contribute to the development of SUI.



Published studies suggest that insulin resistance, which often accompanies overweight and obesity, may compromise pelvic floor muscle integrity and neuromodulation, ultimately leading to a significantly higher risk of UI.<sup>21</sup>

In addition to age and BMI, multivariate analysis demonstrated associations of UI with most known potential risk factors. Notably, the prevalence of UI was 1.6 fold higher among women living in urban areas compared to those living in rural areas (95% CI 1.499–1.861). An important reason for this is that women in rural areas have a shorter life expectancy and a smaller proportion of overweight and obese population, which are considered to be high-risk factors for the development of UI. Furthermore, the threshold for reporting UI is potentially higher for rural women, as harsh living conditions make women focus less on leakage events and are more likely to be ashamed to report UI due to conservative attitudes.

In the present study, MUI occurred more frequently, with greater amounts of leakage, and had a greater impact on the QOL, the same results obtained in the UI prevalence survey conducted in France by Lasserre et al.<sup>22</sup> An important reason for this phenomenon is that MUI has characteristics of both SUI and UI, which increases the frequency, volume and impact on life of urine leakage.

The I-QOL questionnaire revealed that moderate-to-severe MUI has a greater impact on overall QOL than SUI, and is more likely to be behaviorally restrictive and to cause severe psychological burden, a conclusion similarly reached by Monz et al.<sup>23</sup> Overall, the reason that urgency symptoms (such as UI and MUI) are more restrictive to women's behavior and have a worse impact on women's QOL than SUI is that the latter's leakage is predictable, as in SUI the leakage symptoms can be avoided by keeping the bladder empty by urinating earlier.<sup>24</sup>

Our study found that 40.5% of women with UI do not seeking medical attention because the leakage has little impact on their lives. It is true that not all women with UI need surgery or other special treatment, but health care and educational programs for mild UI may help to keep this group of people away from the risk factors for UI and thus prevent further worsening of UI symptoms. In traditional Chinese culture, UI is often considered shameful and often triggers associations with inappropriate sexual activity. In an era of accelerated aging in Chinese society and a gradual increase in the proportion of obese population, the rise in UI prevalence is inevitable, and how to help women to get rid of UI deserves the attention of the health administration.

The strength of our study lies in its large population-based sample. Using a multistage random sampling method, we enrolled 10% of the population in the selected area. Furthermore, the familiarity between the GPs and the respondents is attributed to this high response rate as it reduces embarrassment and discomfort when discussing private topics. Additionally, the ICIQ-SF questionnaire used in the study contains sufficient detail to facilitate the determination of the type and severity of UI. Therefore, we conclude that our study provides the best approximation of UI prevalence among local women.

However, there are several limitations in this study: the diagnosis and severity of UI in this study was based on self-reported data, which is inevitably accompanied by recall errors, it was difficult for the investigators to verify it by physical examination, urine pad test, urodynamic examination for so many respondents. Second, our study failed to include all possible risk factors in the study, such as diabetes mellitus and gynecological diseases, which may result in some potential risk factors not being captured.

This is the largest population-based epidemiological study of UI among women in southern China in recent years. These women had a higher prevalence of UI, which had a significant negative impact on the women's QOL, but only the minority had seeking medical attention. This situation indicates the need for health authorities to develop intervention strategies for UI.

## Data Sharing Statement

The data from this study are available from the corresponding author upon reasonable request.

## Ethics Approval

All respondents included in the survey signed an informed consent form. This study was approved by the Ethics Committee of Fujian Maternity and Child Health Hospital (2023KYLLR01045).

## Acknowledgments

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## Disclosure

The authors report no conflicts of interest in this work.

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