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Prevalence and risk factors of urinary incontinence in pregnant Korean women

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Objective
This study aimed to evaluate the prevalence of urinary incontinence (UI) and its associated risk factors among pregnant Korean women, as UI significantly impacts their quality of life.

Methods
A cross-sectional study involving singleton pregnant women was conducted between April and December 2023. Data were collected using a questionnaire assessing demographic information and UI symptoms. The International Consultation on Incontinence Questionnaire-UI short form was used to diagnose UI.

Results
A total of 824 pregnant women from three centers participated, with an overall prenatal UI prevalence of 40.2% (331/824). Stress UI was most common (77.1%), followed by mixed UI (16.9%), and urgency UI (6.0%). Risk factors for UI included prior delivery mode, specifically vaginal delivery (adjusted odds ratio [aOR], 5.61; 95% confidence interval [CI], 1.40-22.50; *P*=0.015) and combined vaginal and cesarean delivery (aOR, 23.14; 95% CI, 1.77-302.74; *P*=0.017). Additionally, second trimester (aOR, 1.99; 95% CI, 1.19-3.32; *P*=0.009) and third trimester (aOR, 4.44; 95% CI, 2.65-7.40; *P*<0.001) were associated with increased UI risk. Conversely, drinking alcohol before pregnancy was a protective factor (aOR, 0.72; 95% CI, 0.53-0.99; *P*=0.046).

Conclusion
Approximately 40% of Korean pregnant women experience prenatal UI. Prior delivery mode and advanced gastrointestinal age are significant risk factors. Further research with postpartum and long-term follow-ups is needed.

Keywords: Pregnancy; Prevalence; Quality of life; Risk factors; Urinary incontinence

Introduction

Urinary incontinence (UI) is defined as the involuntary leakage of urine [1]. During pregnancy, the growing uterus exerts increased pressure on the pelvic floor muscles (PFM), while hormonal changes can weaken their strength. These factors can lead to changes in the bladder neck and urethra, impairing urethral sphincter function [2].

Consequently, stress UI (SUI), characterized by urine leakage during physical exertion (e.g., exercise, sneezing, or coughing), is prevalent among pregnant women. SUI significantly impacts quality of life (QoL) in areas such as physical activity, travel, social interactions, and emotional well-being, affecting 54.3% of pregnant women [3]. Compared to those

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without SUI, pregnant women with the condition experience a lower QoL [4].

As pregnancy progresses, QoL tends to decline, particularly in women with UI. Moreover, frequent SUI is linked to decreased health-related QoL in both daily life and mental health, including postpartum depression [5].

Data from the Korean National Health Insurance Service-National Sample Cohort (2004-2013) reveals an association between UI and postpartum depression. Among 83,066 postpartum women, 5,393 (6.49%) experienced UI, and 691 (0.83%) developed postpartum depression. The latter was more common among women with UI, especially those aged 15-19, ≥40 years, with low income, or who had a cesarean section [6].

Despite the link between UI and reduced QoL, including depression, limited research exists on the prevalence and risk factors of UI in pregnant Korean women. This study aims to evaluate the prevalence of UI and its associated risk factors among this population.

Materials and methods

This study was approved by the Ethics Committee and conducted in accordance with the Declaration of Helsinki principles. Written informed consent was obtained from all participants, who were fully anonymized. Based on a 54.3% prevalence of SUI [3], a 95% confidence interval (z=1.96), a desired precision of 0.05, and an anticipated 20% non-response rate, the estimated sample size was over 457 participants.

This cross-sectional study was conducted between April and December 2023, involving consenting singleton pregnant women from three South Korean hospitals: Inje University Ilsan Paik Hospital, Daejeon Miz Women's Hospital, and Ulsan Moms Women's Hospital.

A two-part questionnaire was administered. The first section collected demographic data including age, occupation, education, gravidity, parity, delivery method, weight, height, pregnancy weight gain, alcohol and smoking consumption, and constipation status. The second section used the Korean version of the International Consultation on Incontinence Questionnaire-UI short form to assess UI. Participants were asked if they had experienced urine leakage to identify UI [7].

Pregnant women participated in the survey once per trimester (trimester 1: <14 weeks; trimester 2: 14-28 weeks, trimester 3: ≥28 weeks), with no requirement to complete all three surveys.

All participants were included except those meeting the exclusion criteria. These criteria included multiple pregnancies, incomplete surveys, childhood enuresis, pelvic surgery, pelvic organ prolapse, nocturnal enuresis, persistent UI, mental or psychiatric disorders, and uncontrolled diabetes.

Categorical variables were analyzed using the chi-square test. Univariate analysis identified potential risk factors for UI in pregnant women, followed by logistic regression analysis to assess their significance. Statistical significance was set at $P<0.05$.

Results

A total of 824 eligible pregnant women from three study

Table 1. Types and severity of urinary incontinence during pregnancy

Variable	Values
Urinary incontinence	
No	493 (59.8)
Yes	331 (40.2)
Types of urinary incontinence	
Stress	255 (77.1)
Urgency	20 (6.0)
Mixed	56 (16.9)
Episodes of urinary incontinence	
Never	493 (59.8)
Once a week or less	187 (22.7)
Twice or three times a week	72 (8.8)
About once a day	39 (4.7)
Several times a day	27 (3.3)
Always	6 (0.7)
Amount of leak[a]	
Small	269 (81.3)
Moderate	58 (17.5)
Large	4 (1.2)

Values are presented as number (%).
[a]Small: slight moisture on underwear due to urine leakage; moderate: underwear noticeably wet from urine leakage; large: underwear significantly affected by urine leakage.

centers participated, with a 40.2% (331/824) overall prenatal UI prevalence. SUI was most common (77.1%), followed by mixed UI (MUI) (16.9%) and urgency UI (UUI) (6.0%). UI episodes occurred at least once daily in 8.8% of participants, with more than a small leakage amount in 18.7% (Table 1).

Univariate analysis identified age, body mass index (BMI), gravidity, parity, previous delivery mode, gestational trimester, and pre-pregnancy drinking as potential predictors of prenatal UI (Table 2).

Multivariate regression analysis revealed vaginal delivery (adjusted odds ratio [aOR], 5.61; 95% confidence interval [CI], 1.40-22.50; *P*=0.015) and combined vaginal and cesarean delivery (aOR, 23.14; 95% CI, 1.77-302.74; *P*=0.017) as risk factors for UI. Additionally, the second (aOR, 1.99; 95% CI,

Table 2. Comparison of risk factors between pregnancy women with and without urinary incontinence

Variable	Urinary continent	Urinary incontinent	*P*-value
Age group (yr)			0.015
<35	358 (62.6)	214 (37.4)	
≥35	135 (53.6)	117 (46.4)	
BMI before pregnancy (kg/m^2)			0.156
<18.5	47 (70.1)	20 (29.9)	
18.5-22.9	268 (60.9)	172 (39.1)	
23.0-24.9	68 (54.4)	57 (45.6)	
≥25	110 (57.3)	82 (42.7)	
BMI during pregnancy (kg/m^2)			0.001
<18.5	18 (81.8)	4 (18.2)	
18.5-22.9	176 (67.7)	84 (32.3)	
23.0-24.9	94 (56.0)	74 (44.0)	
≥25	205 (54.8)	169 (45.2)	
Gravida			<0.001
1	328 (66.4)	163 (33.2)	
2	130 (50.4)	128 (49.6)	
≥3	34 (45.9)	40 (54.1)	
Parity			<0.001
0	342 (67.5)	165 (32.5)	
1	125 (47.9)	136 (52.1)	
≥2	26 (46.4)	30 (53.6)	
Mode of previous delivery			<0.001
No delivery	339 (67.8)	161 (32.2)	
Cesarean section	91 (60.3)	60 (39.7)	
Vaginal delivery	62 (37.3)	104 (62.7)	
Vaginal delivery and cesarean section	1 (14.3)	6 (85.7)	
Gestational trimester			<0.001
1st trimester	109 (80.7)	26 (19.3)	
2nd trimester	216 (67.1)	106 (32.9)	
3rd trimester	168 (45.8)	199 (54.2)	
Folic acid intake			0.307
No	20 (69.0)	9 (31.0)	
Yes	473 (59.5)	322 (40.5)	

Table 2. Comparison of risk factors between pregnancy women with and without urinary incontinence (Continued)

Variable	Urinary continent	Urinary incontinent	*P*-value
Drinker before pregnancy			0.009
No	159 (53.9)	136 (46.1)	
Yes	333 (63.2)	194 (36.8)	
Cigarette smoking before pregnancy			0.208
No	422 (59.0)	293 (41.0)	
Yes	70 (65.4)	37 (34.6)	
Exercise (frequency a week)			0.108
None	204 (57.5)	151 (42.5)	
1	116 (56.0)	91 (44.0)	
2	146 (65.8)	76 (34.2)	
≥3	26 (66.7)	13 (33.3)	
Occupational status			0.644
Housewife	221 (59.1)	153 (40.9)	
White collar	148 (58.7)	104 (41.3)	
Blue collar	9 (75.0)	3 (25.0)	
Others	115 (61.8)	71 (38.2)	
Family income (monthly: million Won)			0.180
<3	138 (65.1)	74 (34.9)	
300 to <500	211 (58.6)	149 (41.4)	
≥500	144 (57.1)	108 (42.9)	
Education			0.907
Middle school	4 (66.7)	2 (33.3)	
High school	99 (60.7)	64 (39.3)	
University	390 (59.5)	265 (40.5)	
Constipation			0.572
No	309 (60.6)	201 (39.4)	
Yes	184 (58.6)	130 (41.4)	

Values are presented as number (%).
BMI, body mass index.

1.19-3.32; *P*=0.009) and third (aOR, 4.44; 95% CI, 2.65-7.40; *P*<0.001) trimesters were associated with increased UI risk. Conversely, pre-pregnancy drinking was a protective factor (aOR, 0.72; 95% CI, 0.53-0.99; *P*=0.046) (Table 3).

Discussion

UI was defined as any involuntary urine leakage [1]. Pregnant women are at a higher risk of UI, primarily due to temporary disruption to the pelvic floor caused by the growing fetus exerting pressure on the bladder [8]. Mechanical and hormonal changes during pregnancy can also weaken the PFM. Changes in relaxin levels during pregnancy may significantly influence SUI development. While relaxin is crucial for maintaining urinary continence during pregnancy, lower relaxin concentrations in late pregnancy have been correlated with a higher prevalence of SUI in the second and third trimesters [9].

UI often resolves postpartum; however, this condition can persist and become chronic in some women [10]. Women with a history of urinary leakage before or during pregnancy are at increased risk of developing postnatal UI [11]. Moreover, the risk of developing UI was significantly higher at 3

Table 3. Multivariate logistic regression analysis of risk factors of urinary incontinence during pregnancy (n=824)

Risk factor	aOR	95% CI	*P*-value
Age, (yr), ref: <35			
≥35	1.072	0.763-1.505	0.688
BMI, (kg/m^2), ref: 18.5-22.9			
<18.5	0.635	0.199-2.027	0.443
23-24.9	1.148	0.739-1.783	0.540
≥25	1.230	0.851-1.777	0.271
Gravida, ref: 1			
2	0.48	0.147-1.428	0.178
≥3	0.731	0.190-2.813	0.648
Parity, ref: 0			
1	1.338	0.294-6.094	0.707
≥2	0.722	0.123-4.250	0.719
Drinker before pregnancy, ref: non-drinker			
Drinker	0.724	0.528-0.994	0.046
Previous delivery mode, ref: no delivery			
Cesarean section	2.090	0.564-7.738	0.270
Vaginal delivery	5.614	1.401-22.499	0.015
Vaginal delivery and cesarean section	23.137	1.768-302.743	0.017
Gestational trimester, ref: 1st trimester			
2nd trimester	1.986	1.190-3.315	0.009
3rd trimester	4.426	2.649-7.395	<0.001

aOR, adjusted odds ratio; CI, confidence interval; BMI, body mass index.

and 6 months postpartum among women who experienced UI as early as 20 weeks of gestation but received no treatment [12]. This underscores the importance of addressing and managing UI during pregnancy to prevent persistent postpartum incontinence.

This study's 40.2% UI prevalence is similar to previous reports ranging from approximately 35% to 60.4% [13,14]. UI rates vary among different ethnic groups: 26% in Africa, 36% in the Middle East, 40% in East Asia, 43% in South Asia, and 45% in Europe/North America. A study in Karachi also reported a 45% UI prevalence [15].

SUI was the most common UI type in this study (77.1%), followed by MUI (16.9%), and UUI (6.0%). A recent report on Korean women found that 57.4% experienced lower urinary tract symptoms, with UI as the predominant symptom (45.8%), including SUI (33.6%), and UUI (12.2%) [16]. While SUI is the most prevalent UI type in pregnant women [4,17], Daly et al. [18] reported a higher MUI rate (58.8%) than SUI (37.2%) during pregnancy.

Univariate analysis identified age, BMI, gravidity, parity, previous delivery mode, gestational trimester, and pre-pregnancy drinking as factors significantly associated with UI during pregnancy. Multivariate regression analysis confirmed prior delivery mode as a primary risk factor, with vaginal delivery (aOR, 5.61; 95% CI, 1.40-22.50) and combined vaginal and cesarean delivery (aOR, 23.14; 95% CI, 1.77-302.74) significantly increasing UI risk. Additionally, the second (aOR, 1.99; 95% CI, 1.19-3.32) and third (aOR, 4.44; 95% CI, 2.65-7.40) trimesters were associated with higher UI risk. Pre-pregnancy drinking was identified as a protective factor (aOR, 0.72; 95% CI, 0.53-0.99) (Table 3).

Dinç [19] reported previous urinary tract infection, constipation, and gestational age as UI risk factors during pregnancy. UI rates varied by delivery mode: cesarean (19.7%), vaginal (54.9%), and vacuum (87.5%) [19]. UI prevalence was 4.4% and 23.7% in the first and third trimesters, respectively, and higher occurrence and severity was observed in older, overweight/obese, and unemployed women. Cesarean section

reduced UI risk, while spontaneous tears, episiotomy, and high birth weight increased it. PFM training offered protection [20]. Post-vaginal delivery, PFM strength was associated with the cumulative incidence of pelvic organ prolapse and SUI [21].

Consistent with other studies, our findings highlight previous delivery mode as a primary UI risk factor during pregnancy. Vaginal delivery, with associated PFM stretching and potential injury, increases UI risk compared to cesarean section [22]. Advanced gestational age is another key risk factor, likely due to increased uterine pressure, fetal weight, and hormonal changes (e.g., increased progesterone, decreased relaxin, and decreased collagen levels) impacting PFM strength and function [23].

In our study, alcohol consumption before pregnancy was identified as a protective factor against prenatal UI (aOR, 0.72; 95% CI, 0.53-0.99; *P*=0.046). However, the relationship between overall alcohol consumption and UI was not significant [24,25].

A more in-depth investigation is needed to explore the potential protective effect of alcohol consumption before pregnancy, considering factors such as the amount consumed, drinking patterns, and type of alcohol. Such information was not available in the current study. A highly significant negative association was found between baseline beer intake and subsequent overactive bladder onset (*P*=0.001), with reduced risk across all levels of beer consumption compared to non- or infrequent beer drinkers. However, this association was attenuated after adjusting for total alcohol intake (g/day) (*P*=0.02) [26].

To the best of our knowledge, this is the first study reporting UI prevalence during pregnancy in South Korea. The results could be generalized through a larger, multicenter study. The higher UI rate in women with previous vaginal deliveries should be considered when pregnant women make delivery decisions. This study aimed for an adequate sample size and utilized a validated questionnaire across three centers, employing inferential statistics to identify UI risk factors.

Limitations include the study population being restricted to three antenatal clinics, potentially limiting generalizability to all Korean pregnant women. Additionally, UI diagnosis relied solely on questionnaire data, which may have reduced diagnostic accuracy. The study lacked detailed information on vaginal delivery (e.g., vacuum, labor duration, fetal, and newborn weight) and postpartum UI outcomes. As a cross-sectional study, causal relationships could not be established.

Despite limitations, this study provides valuable insights into UI prevalence and risk factors among pregnant Korean women, highlighting the need for prevention and management strategies. Further research is warranted to explore the association between UI and depression during pregnancy, as well as to investigate the impact of UI on postpartum and long-term outcomes. Psychological support for pregnant women with UI is crucial for improving QoL and pregnancy outcomes.

In conclusion, approximately 40% of Korean pregnant women experienced prenatal UI. Prior delivery mode and advanced gestational age were identified as significant risk factors. Further studies should include detailed information on delivery, labor, newborn weight, postpartum period, and long-term follow-up.

Conflict of interest

The authors declare no conflict of interest.

Ethical approval

The study was approved by the Ethics Committee (IRB No: 2023-04-436-001) and was conducted in accordance with the principles of the Declaration of Helsinki.

Patient consent

Written informed consent was obtained from all participants. All participants were fully anonymized.

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