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Knowledge, attitudes, and practices of pregnant and postpartum women regarding stress urinary incontinence

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This study aimed to assess the knowledge, attitudes, and practices (KAP) of pregnant and postpartum women regarding stress urinary incontinence. Conducted in Suzhou from January to March 2024, the cross-sectional study involved 476 participants, predominantly pregnant women (81.3%). Data were collected through self-administered questionnaires, covering demographic characteristics and KAP scores. Findings revealed median scores: knowledge 20.00 [12.00, 28.00] (range: 0–44), attitudes 21.00 [19.75, 24.00] (range: 8–40), and practices 26.00 [22.00, 31.00] (range: 8–40). Structural equation modeling (SEM) showed knowledge directly influenced attitudes (β = -0.153, $p < 0.001$), while both knowledge (β = 0.522, $p < 0.001$) and attitudes (β = -0.128, $p = 0.004$) significantly impacted practices. Moreover, knowledge indirectly affected practices via attitudes (β = 0.020, $p = 0.031$). Multivariate logistic regression indicated that higher knowledge scores (OR = 1.101, $p < 0.001$) and higher education levels were associated with proactive practices. The results highlighted inadequate knowledge and negative attitudes among participants. Consequently, it is vital to implement targeted educational programs aimed at improving understanding and attitudes towards stress urinary incontinence in pregnant and postpartum women, enhancing their self-management behaviors.

Keywords Knowledge, Attitude, Practice, Pregnant women, Maternity, Stress urinary incontinence

Background

Adult female urinary incontinence, characterized by involuntary urine loss, is clinically categorized into three distinct types: stress urinary incontinence, urgency urinary incontinence, and mixed urinary incontinence, involving symptoms of both stress and urgency urinary incontinence, though not necessarily at the same time[1]. Among these, stress urinary incontinence, which occurs with increased abdominal pressure such as during coughing, sneezing, physical exercise, or laughter, is the most common form in women. Its prevalence is age-dependent and can vary significantly, ranging from 21 to 46%[2]. A meta-analysis conducted over the past decade revealed that the overall prevalence of stress urinary incontinence among adult women in China is approximately 23.2%[3,4].

The Knowledge, Attitude, Practice (KAP) model, foundational to health literacy, posits that enhanced knowledge positively influences attitudes, which in turn, guide individual behaviors[5]. This model is crucial in shaping health behaviors and is commonly applied using the KAP questionnaire to evaluate the knowledge, attitudes, and practices within specific populations in the healthcare sector. It also helps assess the demand for and acceptance of pertinent information[6,7].

Stress urinary incontinence, the most prevalent form of urinary incontinence during pregnancy, significantly impacts women's health[8,9]. Women accept their disability and do not seek medical help. This is a result of

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embarrassment, but also fear of going to the hospital and having possible surgery. With a lack of appropriate hygiene products or financial resources to purchase them, urinary incontinence may be a factor excluding a woman from normal life. Ignorance regarding the possibilities of conservative treatment causes women to deliberately give up their daily activities. Such behavior negatively affects social, family, and matrimonial relations, and thus, drastically worsens the quality of a woman's life, leaving her with a feeling of discomfort, helplessness, alienation, and stress[10]. The KAP of these women regarding stress urinary incontinence, which is essential for devising targeted interventions that can enhance their quality of life by effectively managing or preventing the condition. Additionally, women's perceptions profoundly influence their selection and adherence to treatment options, underscoring the clinical significance of exploring their KAP[11]. Therefore, this study aimed to explore the KAP regarding stress urinary incontinence among pregnant and postpartum women.

Methods

Study design and participants

This cross-sectional study was conducted between January and March, 2024, and included pregnant and postpartum women. This study has been approved by Medical Ethics Committee of Suzhou Science & Technology Town Hospital (approval number: IRB202208011RI) and informed consent was obtained from the participants.

The inclusion criteria were: (1) pregnant women or postpartum women within 42 days after delivery; (2) voluntary participation. Those who refused to participate or in condition that unable to complete the questionnaire were excluded.

Questionnaire

The questionnaire was developed with guidance from existing literature[12–14], and local guidelines, including "Guidelines for the Diagnosis and Treatment of Stress Urinary Incontinence in Women" and the "Summary of the Best Evidence for the Prevention and Management of Stress Urinary Incontinence in Pregnancy and Postpartum Patients." The design was further refined based on feedback from five senior experts with over 20 years of experience in gynecology and obstetrics, ensuring the content validity of the questionnaire. The questionnaire was then tested in a pilot study involving 29 respondents, achieving a reliability coefficient (Cronbach's α) of 0.902, indicated a good internal consistency. The face validity was evaluated during the pilot study, where none of the 29 participants reported difficulty understanding the questionnaire items[15]. In the full study population, the questionnaire showed excellent internal consistency, with a Cronbach's α of 0.947. Construct validity was supported by a Kaiser-Meyer-Olkin (KMO) value of 0.909, indicating sampling adequacy for factor analysis. Confirmatory factor analysis (CFA) demonstrated good construct validity, with CMIN/DF = 3.902, RMSEA = 0.078, IFI = 0.847, TLI = 0.834, and CFI = 0.846.

The finalized questionnaire (Supplementary material-Questionnaire) is in Chinese and encompasses four sections: demographic characteristics, knowledge, attitudes, and practices. The knowledge section consists of 22 items, with responses scored as 2 ("understand"), 1 ("partial understanding"), and 0 ("do not understand"). Both the attitudes and practices sections contain 8 items each and employ a five-point Likert scale for responses. Additionally, family support was assessed using the Family Support Scale (PSS-Fa)[16], consisting of 15 items scored as 1 ("yes") or 0 ("no"), with some items scored in reverse. The aggregate scores categorize family support levels as low (0–5 points), moderate (6–10 points), or high (11–15 points). Participants who scored above 80% of the total were categorized as having adequate knowledge, positive attitude, and proactive practice. Those falling within the range of 60–80% of the total were classified as having moderate knowledge, attitude, and practice. Scores below 60% of the total were indicative of inadequate knowledge, negative attitude, and inactive practice[17].

Data collection

The pregnant and postpartum women were invited to participate using convenience sampling method. The questionnaire was uploaded to the Wenjuanxing platform (www.wjx.cn), and a QR code and link were generated. Trained research assistants explained the research purpose to the participants and assisted with questionnaire distribution. Pregnant women were invited to participate during their prenatal examinations, while postpartum women were recruited either during their inpatient stay or during postnatal follow-up visits.

Statistical analysis

Statistical analysis was conducted using R 4.3.2 and Stata 18.0 (Stata Corporation, College Station, TX, USA). Continuous variables were confirmed to skewed distribution, and described using median (25th percentile, 75th percentile), and compared by Wilcoxon-Mann-Whitney tests or Kruskal-Wallis test. Categorical variables were presented as n (%). Spearman correlation analysis was employed to assess the correlations between knowledge, attitude, and practice scores. Univariate and multivariate logistic regression were performed to explore the risk factors associated with K, A, and P, with 60% of the total score was used as the cut-off value[18]. Univariate variables with $P < 0.1$ were enrolled in multivariate regression. Using the KAP theoretical framework, a structural equation model (SEM) was employed to examine whether attitudes mediate the relationship between knowledge and practical behavior. A two-sided $P < 0.05$ were considered statistically significant in this study.

Result

Demographic characteristics

Among the 476 pregnant women or maternity who participated in this study, 387 (81.3%) were pregnant women, 72 (15.1%) were older than 35 years, 312 (65.5%) had college/bachelor's degree, 212 (44.5%) had 1 time of pregnancy, 257 (54.0%) had 1 time of childbirth, 195 (41.0%) had a miscarriage experience, 282 (59.2%) had a BMI of 18.5–24 kg/m^2, 428(89.9%) had high level of family support. Out of 89(18.7%) maternity, 41(8.6%) had

experienced stress urinary incontinence during pregnancy and only 9(1.9%) received appropriate treatment. The median [25%,75%] knowledge, attitude, and practice scores were 20.00 [12.00, 28.00] (possible range: 0–44), 21.00 [19.75, 24.00] (possible range: 8–40), and 26.00 [22.00, 31.00] (possible range: 8–40), respectively. Participants' knowledge scores were more likely to vary depending on: number of pregnancies ($P=0.002$), number of childbirths ($P<0.001$), number of vaginal births ($P=0.001$), number of cesarean sections ($P=0.001$), Identity ($P=0.018$), experience of stress urinary incontinence during pregnancy ($P=0.012$), received appropriate treatment ($P=0.007$), gestational age ($P=0.035$), and the current time until delivery ($P=0.040$). Meanwhile, participants with different childbirth weight were more likely to have different attitude scores. Participants' practice scores were more likely to vary depending on: experience of stress urinary incontinence during pregnancy ($P=0.035$), residence ($P<0.001$), family's monthly per capita income ($P=0.006$), and education ($P<0.001$) (Table 1).

Knowledge, attitude, and practice

The distribution of knowledge dimensions shown that the three questions with the highest number of participants choosing the "Do not understand" option were "Abbreviated version of the International Consultation Questionnaire on Urinary Incontinence" (K5-4) with 68.3%, "3IQ Urinary Incontinence Questionnaire" (K5-2) with 64.9%, and "Genitourinary Impact Scale - Short version" (K5-1) with 64.5%, suggesting that more than half of the participants' knowledge of urinary incontinence assessment tool was inadequate (Table 2).

When it comes to attitudes regarding stress urinary incontinence, 28.8% were very concerned about its impact on their quality of life (A6) and 16% were very concerned that it could not be completely cured (A5). In addition, 11.6% strongly agreed and 26.7% agreed that they would be embarrassed if they went to the hospital due to stress urinary incontinence (A2) (Table 3).

Responses to the practice dimension showed that 31.9% rarely and 11.6% never actively participated in education about pregnancy healthcare (P1), 23.7% rarely and 21.2% never consulted a doctor about pelvic floor exercises (P6), and 19.7% rarely and 20.2% never sought professional assessment before performing pelvic floor exercises (P7), suggesting that the practice of these participants needs to be promoted in these areas (Table 4).

SEM and multivariate logistic regression

Multivariate logistic regression showed that 2 times childbirths and above (OR = 2.441, 95% CI: [1.051, 5.669], $P=0.038$) was independently associated with good knowledge **(Supplementary Table 1)**. Concurrently, postpartum woman (OR = 1.791, 95% CI: [1.061, 3.024], $P=0.029$) was independently associated with positive attitude **(Supplementary Table 2)**. Furthermore, knowledge score (OR = 1.101, 95% CI: [1.074, 1.128], $P<0.001$), college/undergraduate education (OR = 2.338, 95% CI: [1.324,4.128], $P=0.003$), master degree education and above (OR = 5.042, 95% CI: [1.904,13.350], $P=0.001$) were independently associated with proactive practice **(Supplementary Table 3)**.

The SEM demonstrate a highly favorable model fit indices, suggesting a well-fitting model **(Supplementary Table 4)**. The results of analysis of direct and indirect effects showed that knowledge directly affected attitude (β = -0.153, $P<0.001$), knowledge ($\beta=0.522$, $P<0.001$) and attitude (β = -0.128, $P=0.004$) directly affected practice, and knowledge indirectly affected practice through attitude ($\beta=0.020$, $P=0.031$) (Fig. 1 and Table 5).

Discussion

This study reveals that pregnant and postpartum women exhibit limited knowledge, negative attitudes and moderate practices towards stress urinary incontinence. Clinical initiatives should prioritize educational programs that enhance knowledge and reshape attitudes to further improve proactive practices and outcomes in managing stress urinary incontinence among pregnant and postpartum women.

Several studies reveal consistent gaps and barriers that influence effective management. The study from Scotland[19] identifies a significant gap in knowledge about pelvic floor exercises among pregnant women, with a notable desire for more information expressed by the participants. This suggests a common trend of insufficient proactive information provision by healthcare providers. Furthermore, research from Malaysia[20] reported that despite good levels of knowledge and positive attitudes towards pelvic floor muscle training (PFMT), there remains a large discrepancy in actual practices. This aligns with the findings from a Norwegian study[21], where barriers such as lack of self-discipline and skepticism about the efficacy of PFME (Pelvic Floor Muscle Exercise) prevented regular practice.

Women with a greater number of childbirths displayed higher knowledge scores. This correlation is supported by multivariate logistic regression, indicating that having childbirths two times or more is independently associated with better knowledge. This result is consistent with literature suggesting that repeated interactions with healthcare systems during multiple childbirths may enhance awareness and understanding of health issues[22,23]. Similarly, the number of vaginal births and cesarean sections correlated with knowledge differences, with those having fewer vaginal births or one cesarean section scoring higher. Surgical births may lead to more intensive postoperative education, thereby increasing knowledge.

Interestingly, women without experience of stress urinary incontinence during pregnancy scored higher in proactive practices. This counterintuitive result may be influenced by preventive measures or education received during prenatal care, as supported by existing research which suggests that anticipatory guidance can improve self-management behaviors[24]. Geographical differences also emerged, with urban dwellers scoring higher in practices compared to rural counterparts. This disparity could be attributed to better access to healthcare resources and education in urban areas[25]. The overall knowledge deficit observed may also be due to a lack of routine education on pelvic floor health in standard prenatal programs, particularly in rural or lower-resource settings. Systemic barriers such as limited provider training, time constraints during antenatal visits, and low

N = 476	N(%)	Knowledge	P	Attitude	P	Practice	P
		Median [25%,75%] or mean (± SD)		Median [25%,75%] or mean (± SD)		Median [25%,75%] or mean (± SD)	
Total score	476(100.0)	20.00 [12.00, 28.00]		21.00 [19.75, 24.00]		26.00 [22.00, 31.00]	
Age, years			0.586		0.977		0.087
< 30	212(44.5)	21.00 [12.00, 28.00]		21.00 [20.00, 24.00]		27.00 [22.75, 31.25]	
30–34	192(40.3)	19.00 [12.00, 27.00]		21.00 [20.00, 24.00]		25.00 [21.75, 30.00]	
≥ 35	72(15.1)	21.50 [11.75, 30.25]		22.00 [19.00, 24.00]		26.00 [23.00, 31.25]	
Number of pregnancies			0.002		0.473		0.130
1 time	212(44.5)	18.00 [10.00, 26.00]		21.00 [20.00, 24.00]		26.00 [22.75, 30.00]	
2–3 times	204(42.9)	22.00 [14.75, 30.00]		21.00 [19.00, 24.00]		26.50 [22.00, 32.00]	
More than 3 times	60(12.6)	19.00 [13.75, 27.25]		22.50 [19.00, 24.00]		24.00 [19.75, 30.00]	
Number of childbirths			< 0.001		0.825		0.938
1 time	257(54.0)	18.00 [10.00, 25.00]		21.00 [20.00, 24.00]		26.00 [22.00, 30.00]	
2 times and above	219(46.0)	22.00 [14.00, 31.00]		22.00 [19.00, 24.00]		26.00 [22.00, 32.00]	
Number of vaginal births (natural births)			0.001		0.354		0.695
0 times	81(17.0)	24.00 [16.00, 31.00]		22.00 [19.00, 24.00]		26.00 [21.00, 31.00]	
1 time	105(22.1)	22.00 [14.00, 30.00]		21.00 [19.00, 24.00]		26.00 [22.00, 32.00]	
2 times and above	33(6.9)	21.00 [13.00, 36.00]		23.00 [20.00, 24.00]		26.00 [22.00, 30.00]	
Number of cesarean sections			< 0.001		0.574		0.919
0 timess	129(27.1)	21.00 [14.00, 30.00]		22.00 [19.00, 24.00]		26.00 [22.00, 32.00]	
1 time	68(14.3)	25.00 [15.00, 32.25]		22.00 [19.00, 24.00]		26.00 [21.00, 32.25]	
2 times and above	22(4.6)	20.00 [16.25, 29.50]		23.00 [20.00, 24.75]		26.50 [21.50, 29.50]	
Miscarriage			0.448		0.553		0.343
No	281(59.0)	19.00 [12.00, 28.00]		21.00 [20.00, 24.00]		26.00 [23.00, 31.00]	
Yes	195(41.0)	21.00 [13.00, 28.50]		21.00 [19.00, 24.00]		26.00 [21.50, 31.00]	
Pre-pregnancy weight, kg			0.673		0.170		0.723
< 55	189(39.7)	19.00 [12.00, 28.00]		22.00 [20.00, 24.00]		26.00 [23.00, 31.00]	
55–65	176(37.0)	20.50 [12.00, 27.00]		22.00 [20.00, 24.00]		26.00 [22.00, 32.00]	
≥ 65 kg	111(23.3)	21.00 [12.50, 29.00]		20.00 [19.00, 24.00]		26.00 [22.00, 30.00]	
BMI, kg/m^2			0.314		0.222		0.577
≤ 18.5	42(8.8)	18.00 [12.00, 27.75]		21.50 [20.00, 24.00]		25.00 [21.00, 29.75]	
18.5–24	282(59.2)	20.00 [11.25, 27.00]		22.00 [20.00, 24.00]		27.00 [23.00, 31.00]	
24–28	100(21.0)	22.00 [14.00, 28.25]		20.00 [19.00, 24.00]		26.00 [21.00, 32.00]	
≥ 28	52(10.9)	18.50 [12.75, 29.25]		22.00 [19.00, 24.00]		25.50 [22.00, 31.00]	
Status			0.018		0.063		0.542
Pregnant woman	387(81.3)	19.00 [11.00, 27.00]		21.00 [19.00, 24.00]		26.00 [22.00, 31.00]	
Postpartum woman	89(18.7)	22.00 [15.00, 31.00]		23.00 [20.00, 24.00]		27.00 [22.00, 32.00]	
Birth term status			0.051		0.176		0.688
Premature birth (< 36 + 6 weeks)	84(17.6)	21.50 [15.00, 30.25]		23.00 [20.00, 24.00]		27.00 [22.00, 32.00]	
Full-term delivery (37 ~ 41 + 6 weeks)	5(1.1)	22.00 [21.00, 42.00]		24.00 [19.00, 24.00]		26.00 [26.00, 40.00]	
Weight gain during pregnancy, kg			0.057		0.122		0.098
≤ 15	52(10.9)	21.00 [14.75, 31.25]		22.00 [19.75, 24.00]		29.00 [23.75, 32.25]	
> 15	37(7.8)	22.00 [17.00, 30.00]		23.00 [20.00, 24.00]		26.00 [20.00, 30.00]	
Childbirth weight, kg			0.057		0.033		0.828
≤ 3.5	61(12.8)	22.00 [14.00, 30.00]		22.00 [19.00, 24.00]		26.00 [23.00, 32.00]	
> 3.5	28(5.9)	20.50 [17.00, 32.25]		24.00 [21.75, 25.00]		28.00 [21.50, 31.25]	
Experience of stress urinary incontinence during pregnancy			0.012		0.056		0.035
No	48(10.1)	22.50 [16.75, 36.50]		22.00 [19.00, 24.00]		28.50 [24.00, 34.00]	
Yes	41(8.6)	20.00 [14.00, 27.00]		23.00 [21.00, 24.00]		26.00 [18.00, 30.00]	
Received appropriate treatment			0.007		0.152		0.823
No	80(16.8)	21.00 [14.75, 30.00]		23.00 [20.00, 24.00]		26.50 [22.00, 32.00]	
Yes	9(1.9)	31.00 [27.00, 37.00]		20.00 [17.00, 25.00]		29.00 [23.00, 31.00]	
Gestational age			0.035		0.286		0.402
Early pregnancy (< 14 weeks)	28(5.9)	25.00 [14.50, 30.00]		22.00 [19.00, 24.00]		27.50 [24.00, 34.00]	
Second trimester (14 ~ 27 + 6 weeks)	113(23.7)	19.00 [13.00, 26.00]		21.00 [20.00, 24.00]		26.00 [22.00, 29.00]	
Third trimester (after 28 weeks)	246(51.7)	19.00 [10.00, 27.00]		21.00 [19.00, 24.00]		26.00 [22.00, 31.00]	
Continued							

N = 476	*N*(%)	Knowledge	*P*	Attitude	*P*	Practice	*P*
		Median [25%,75%] or mean (± SD)		Median [25%,75%] or mean (± SD)		Median [25%,75%] or mean (± SD)	
The current time until your delivery			0.040		0.151		0.817
Less than 90 days	257(54.0)	19.00 [11.00, 27.00]		21.00 [20.00, 24.00]		26.00 [22.00, 31.00]	
Greater than or equal to 90 days	130(27.3)	21.00 [12.25, 28.00]		21.00 [19.00, 24.00]		26.00 [22.00, 30.00]	
Residence			0.347		0.499		< 0.001
Rural area	66(13.9)	21.00 [11.00, 23.75]		21.00 [20.00, 24.00]		22.50 [18.25, 27.00]	
City	361(75.8)	20.00 [12.00, 29.00]		21.00 [19.00, 24.00]		27.00 [23.00, 32.00]	
Suburbs	49(10.3)	22.00 [14.00, 26.00]		22.00 [20.00, 24.00]		26.00 [22.00, 29.00]	
Family's monthly per capita income, CNY			0.096		0.735		0.006
2000–5000	103(21.6)	18.00 [11.50, 24.00]		22.00 [19.50, 24.00]		24.00 [21.00, 30.00]	
5000–10,000	192(40.3)	22.00 [14.00, 29.00]		21.00 [20.00, 24.00]		26.00 [22.00, 31.00]	
10,000–20,000	181(38.0)	19.00 [11.00, 29.00]		21.00 [19.00, 24.00]		27.00 [24.00, 32.00]	
Education			0.574		0.216		< 0.001
Junior high school and below	111(23.3)	18.00 [12.00, 25.50]		22.00 [20.00, 24.00]		23.00 [19.00, 27.00]	
College/Undergraduate	312(65.5)	21.00 [12.75, 28.00]		21.00 [19.75, 24.00]		27.00 [23.00, 32.00]	
Master degree and above	53(11.1)	18.00 [12.00, 26.00]		20.00 [19.00, 24.00]		28.00 [25.00, 31.00]	
Family Support Scale			0.633		0.689		0.923
Low level of family support	6(1.3)	22.00 [22.00, 24.25]		20.50 [20.00, 23.25]		25.00 [24.25, 30.25]	
Medium level of family support	42(8.8)	21.50 [14.00, 28.75]		22.00 [20.00, 24.00]		25.50 [22.00, 32.00]	
High level of family support	428(89.9)	20.00 [12.00, 28.00]		21.00 [19.00, 24.00]		26.00 [22.00, 31.00]	

Table 1. Baseline characteristics and KAP scores.

Knowledge	Understand	Partial understand	Do not understand
1. Stress urinary incontinence denotes the involuntary release of urine triggered by heightened abdominal pressure, such as during sneezing or coughing. This condition stands as the prevailing form of urinary incontinence in women.	215 (45.2%)	219 (46%)	42 (8.8%)
2. The main causes of stress urinary incontinence include damage to the muscles that support the urethra(such as pelvic floor muscles), pelvic floor muscle relaxation, and surgical injuries.	166 (34.9%)	230 (48.3%)	80 (16.8%)
3. Stress urinary incontinence can be categorized into mild, moderate, and severe based on varying clinical presentations and symptoms?	149 (31.3%)	226 (47.5%)	101 (21.2%)
4. The following factors are high-risk factors for stress urinary incontinence during pregnancy and postpartum:			
4 – 1: Advanced age (over 35 years old)	157 (33%)	193 (40.5%)	126 (26.5%)
4 – 2: BMI is high (more than 25 kg/m^2)	125 (26.3%)	158 (33.2%)	193 (40.5%)
4 – 3: Excessive weight gain during pregnancy	208 (43.7%)	185 (38.9%)	83 (17.4%)
4–4: Past pregnancy and childbirth history	219 (46%)	154 (32.4%)	103 (21.6%)
4–5: Vaginal/forceps delivery	164 (34.5%)	179 (37.6%)	133 (27.9%)
4–6: Multiple pregnancy	178 (37.4%)	160 (33.6%)	138 (29%)
4–7: Fetal birth weight is too large (more than 4 kg)	219 (46%)	165 (34.7%)	92 (19.3%)
4–8: High-intensity exercise during pregnancy and childbirth	176 (37%)	200 (42%)	100 (21%)
4–9: Family history of urinary incontinence	120 (25.2%)	145 (30.5%)	211 (44.3%)
5. Do you know the following urinary incontinence assessment tool			
5 – 1: Genitourinary Impact Scale - Short version	57 (12%)	112 (23.5%)	307 (64.5%)
5 – 2: 3IQ Urinary Incontinence Questionnaire	57 (12%)	110 (23.1%)	309 (64.9%)
5 – 3: Brief form of Urinary Incontinence Impact Questionnaire	66 (13.9%)	128 (26.9%)	282 (59.2%)
5 – 4: Abbreviated version of the International Consultation Questionnaire on Urinary Incontinence	50 (10.5%)	101 (21.2%)	325 (68.3%)
6. Are you familiar with the following examinations pertinent to urinary incontinence:			
6 – 1: Transperineal pelvic floor ultrasound examination	110 (23.1%)	154 (32.4%)	212 (44.5%)
6 – 2: Pelvic floor muscle function examination	165 (34.7%)	183 (38.4%)	128 (26.9%)
6 – 3: Bladder Stress Test	88 (18.5%)	167 (35.1%)	221 (46.4%)
6 – 4: Cough load test	90 (18.9%)	161 (33.8%)	225 (47.3%)
7. Stress urinary incontinence may be mitigated through adherence to a balanced diet, weight management, and engagement in prenatal exercise.	125 (26.3%)	208 (43.7%)	143 (30%)
8. Pelvic floor muscle training is the first-line treatment for stress urinary incontinence.	160 (33.6%)	199 (41.8%)	117 (24.6%)

Table 2. Distribution of knowledge dimension responses.

Attitude	Strongly agree	Agree	Neutral	Disagree	Strong disagree
1. I am concerned about the possibility of developing stress urinary incontinence as a consequence of childbirth	122 (25.6%)	243 (51.1%)	93 (19.5%)	15 (3.2%)	3 (0.6%)
2. I would feel embarrassed if I went to the hospital because of stress incontinence	55 (11.6%)	127 (26.7%)	109 (22.9%)	152 (31.9%)	33 (6.9%)
3. Stress urinary incontinence is both preventable and treatable	113 (23.7%)	277 (58.2%)	82 (17.2%)	2 (0.4%)	2 (0.4%)
4. Preventing the occurrence of stress urinary incontinence is more important than treating it afterwards	160 (33.6%)	221 (46.4%)	83 (17.4%)	10 (2.1%)	2 (0.4%)
5. I am concerned that stress urinary incontinence may not be entirely curable	76 (16%)	177 (37.2%)	136 (28.6%)	76 (16%)	11 (2.3%)
6. I am worried about the impact stress urinary incontinence will have on my quality of life.	137 (28.8%)	233 (48.9%)	81 (17%)	24 (5%)	1 (0.2%)
7. I am concerned about how my stress urinary incontinence may affect my social activities.	135 (28.4%)	233 (48.9%)	85 (17.9%)	21 (4.4%)	2 (0.4%)
8. I am worried about the impact of stress urinary incontinence on my work.	126 (26.5%)	237 (49.8%)	90 (18.9%)	22 (4.6%)	1 (0.2%)

Table 3. Distribution of attitude dimension responses.

Practice	Always	Often	General	Occasionally	Never
1. I actively participate in education about pregnancy health care	60 (12.6%)	88 (18.5%)	121 (25.4%)	152 (31.9%)	55 (11.6%)
2. I intend to manage my weight gain during pregnancy	92 (19.3%)	140 (29.4%)	153 (32.1%)	69 (14.5%)	22 (4.6%)
3. I follow the doctor's advice to adjust my diet	132 (27.7%)	196 (41.2%)	103 (21.6%)	32 (6.7%)	13 (2.7%)
4. I follow the doctor's instructions for prenatal exercise	99 (20.8%)	163 (34.2%)	141 (29.6%)	62 (13%)	11 (2.3%)
5. I routinely attend hospital visits for follow-up appointments	257 (54%)	119 (25%)	49 (10.3%)	35 (7.4%)	16 (3.4%)
6. I asked my doctor about pelvic floor muscle exercises	57 (12%)	66 (13.9%)	139 (29.2%)	113 (23.7%)	101 (21.2%)
7. Prior to initiating pelvic floor muscle training, I seek professional evaluation	83 (17.4%)	85 (17.9%)	118 (24.8%)	94 (19.7%)	96 (20.2%)
8. I seek supervision from a health care professional when performing pelvic floor muscle training	92 (19.3%)	76 (16%)	123 (25.8%)	88 (18.5%)	97 (20.4%)

Table 4. Distribution of practice dimension responses.

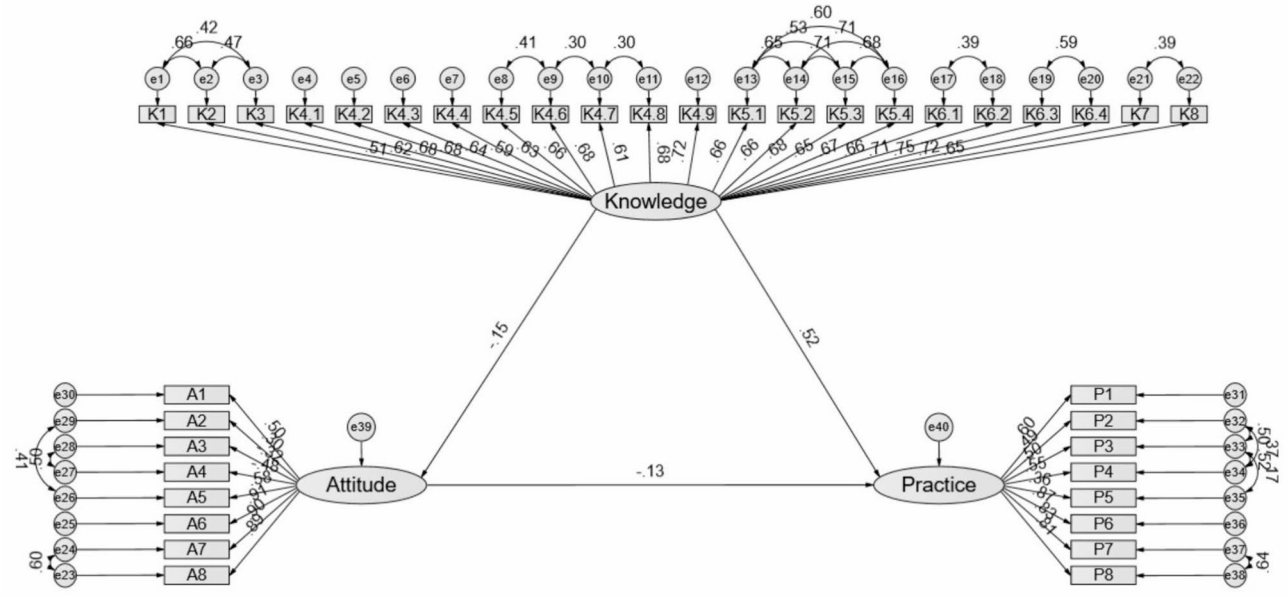

Fig. 1. Structural equation model illustrating the relationships between knowledge, attitudes, and practices regarding stress urinary incontinence among pregnant and postpartum women.

prioritization of urinary incontinence in public health messaging may further contribute to this gap. These factors highlight the need to embed urinary incontinence education into broader maternal health services at both institutional and policy levels.

Furthermore, educational level significantly impacted practice scores, with those holding a master's degree or higher exhibiting the highest scores. This finding is corroborated by logistic regression showing that higher educational levels are independently associated with more proactive practices. This relationship is well-documented in health literature, where higher education often correlates with better health literacy and self-

Model paths	Total effects		Direct Effect		Indirect effect	
	β(95% CI)	*P*	β(95% CI)	*P*	β(95% CI)	*P*
Asum						
Ksum	-0.153 (-0.249,-0.057)	< 0.001	-0.153 (-0.249,-0.057)	< 0.001		
Psum						
Asum	-0.128 (-0.217,-0.040)	0.004	-0.128 (-0.217,-0.040)	0.004		
Ksum	0.542 (0.468,0.616)	< 0.001	0.522 (0.446,0.598)	< 0.001	0.020 (0.002,0.038)	0.031

Table 5. Analysis of direct and indirect effects.

management capabilities[26]. In our study, despite relatively high levels of family support, this factor was not significantly associated with knowledge, attitudes, or practices. This might suggest that support alone is insufficient without targeted informational content. Additionally, the unexpectedly higher practice scores among women without prior stress urinary incontinence experience could indicate the effectiveness of antenatal education in preventing symptom onset, which warrants further investigation. These insights may be unique to the Chinese maternal population within the studied urban context, highlighting cultural and systemic differences that merit future exploration. Non-association of family support with KAP scores might indicate that while family support is generally beneficial for health outcomes, its direct influence on specific health behaviors such as the practice of pelvic floor exercises may not be straightforward. Family members might lack the specific knowledge or awareness necessary to encourage or guide effective practices for managing stress urinary incontinence.

SEM revealed that knowledge directly influenced attitudes, and both knowledge and attitudes directly impacted practices. Moreover, knowledge indirectly affected practices through attitudes. These results emphasize the interdependence of knowledge, attitudes, and practices and are supported by previous studies which suggest that enhancing knowledge can positively modify attitudes, subsequently leading to improved health practices[27].

The distribution of knowledge regarding stress urinary incontinence among pregnant and postpartum women reveals significant gaps, especially in understanding specific risk factors and diagnostic assessments. For instance, a substantial number of participants lack familiarity with the Genitourinary Impact Scale and other diagnostic tools, with over 60% reporting minimal or no knowledge of these instruments. This lack of awareness is concerning given the importance of early diagnosis and management in preventing long-term complications. To improve this, targeted educational programs delivered via popular Chinese social media platforms like WeChat may be effective. Interactive online workshops and informational videos can be designed to enhance understanding of stress urinary incontinence, its risk factors, and the importance of early diagnostic assessments. Additionally, integrating this information into antenatal and postnatal care protocols could further ensure that women receive this knowledge as part of routine healthcare[28,29].

The attitudes towards stress urinary incontinence, particularly regarding the potential embarrassment of seeking hospital treatment, highlight a significant stigma associated with this condition. Nearly a third of the respondents felt embarrassed about going to the hospital for stress incontinence issues. This stigma can deter women from seeking necessary medical help, which is consistent with findings from other cultures as well[30]. Similar findings have been reported in studies from Scotland and Norway, where women also expressed reluctance to seek help due to perceived stigma and embarrassment[19,21]. However, in some Western contexts, open discussions and routine counseling about pelvic floor health may slightly reduce this barrier. In contrast, in our study population, the higher level of discomfort may be compounded by sociocultural norms around discussing urinary or reproductive health publicly, particularly among less-educated or rural groups. Although the study did not assess the source of embarrassment in detail, the sense of shame may arise from both societal perceptions of female roles and personal feelings of inadequacy or uncleanliness. In traditional contexts, women are often expected to maintain bodily control and cleanliness, and incontinence may be perceived as a deviation from these norms[31]. This could explain why even preventable and treatable conditions such as stress urinary incontinence elicit feelings of humiliation, especially in the absence of open discussion or health education. To combat this, there is a need for public health campaigns that aim to normalize discussions around stress urinary incontinence and emphasize its treatability. Such campaigns could involve testimonials from women who have successfully managed the condition, shared on platforms widely accessed by the target demographic,. Furthermore, training healthcare providers to address these issues sensitively and provide reassurances could alleviate fears and reduce stigma[32,33].

In the practice dimension, it is evident that while many women regularly visit hospitals for follow-ups, fewer engage consistently in recommended preventive practices such as pelvic floor muscle training. Only a minority seek professional evaluation before starting such training, which is crucial for effective management of stress urinary incontinence. This discrepancy in practice could be due to a lack of awareness about the effectiveness of pelvic floor exercises or the perceived complexity of these exercises. To enhance engagement in these practices, healthcare providers should offer more accessible and supervised training sessions, possibly through local community centers or via online platforms that allow for virtual supervision. Additionally, developing simple instructional materials that can be easily understood and followed, and distributing these through healthcare providers or via social media platform could increase adherence to recommended practices[34–36].

This study has several limitations. First, the cross-sectional design limits our ability to infer causality between knowledge, attitudes, and practices regarding stress urinary incontinence. Second, the use of self-administered questionnaires might introduce response bias, as participants may provide socially desirable answers or misunderstand questions. Third, women with pre-existing urinary disorders and those with mental health

conditions, such as obsessive-compulsive disorder, were not explicitly excluded, which may influence the results. Lastly, the study was conducted in a specific geographical location, which may limit the generalizability of the findings to other populations or regions with different cultural and healthcare contexts. Future longitudinal studies are recommended to explore the causal relationships among knowledge, attitudes, and practices over time and to validate the association suggested by our SEM analysis. Additionally, future research could consider using a mixed-method approach to triangulate quantitative findings with in-depth qualitative insights, and conducting multi-center studies across diverse regions to enhance the generalizability of the results.

In conclusion, the study highlights a significant gap in the KAP towards stress urinary incontinence among pregnant and postpartum women. It is crucial to integrate targeted educational programs on stress urinary incontinence into maternal healthcare services to enhance knowledge and positively influence attitudes, thereby improving preventative and management practices. These findings also underscore the need for policymakers to incorporate pelvic floor health education and screening into national maternal health strategies as part of broader public health planning. This includes developing structured public health campaigns to destigmatize the condition, incorporating pelvic floor health modules into professional medical training, and integrating urinary incontinence education into routine maternal health policy frameworks.

Data availability

All data generated or analysed during this study are included in this published article.

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Author contributions

Qin Dong and Shenxian Wan carried out the studies, participated in collecting data, and drafted the manuscript. Ruihua Wang and Hong Shen performed the statistical analysis and participated in its design. Sanshan Guo and Ningjuan Wang participated in acquisition, analysis, or interpretation of data and draft the manuscript. All authors read and approved the final manuscript.

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Declarations

Competing interests

The authors declare no competing interests.

Ethics approval and consent to participate

All procedures were performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments. This study has been approved by Medical Ethics Committee of Suzhou Science & Technology Town Hospital (approval number: IRB202208011RI) and informed consent was obtained from the participants The study was carried out in accordance with the applicable guidelines and regulations.

Consent for publication

Not applicable.

Additional information

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