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ORIGINAL RESEARCH

Knowledge, Attitudes, and Practices of Pregnant Women and Their Spouses Toward Intraspinal Labor Analgesia

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Introduction: This study aimed to investigate the knowledge, attitude, and practice (KAP) of pregnant women and their spouses toward intraspinal delivery analgesia.

Methods: This cross-sectional study recruited pregnant women and their spouses at Qilu Hospital in 2023.

Results: A total of 628 valid questionnaires were included (465 pregnant women and 163 spouses). The mean KAP scores were 6.44 ± 6.04 (possible range: 0–18), 36.33 ± 5.87 (possible range: 10–50), and 15.71 ± 3.16 (possible range: 4–20), respectively. Pregnant women had higher knowledge, attitude, and practice scores than spouses (all $P<0.05$). SEM showed that knowledge positively influenced both attitude ($\beta=0.425$, 95% CI: 0.352–0.497, $P<0.001$) and practice ($\beta=0.580$, 95% CI: 0.517–0.644, $P<0.001$), and attitude positively influenced practice ($\beta=0.612$, 95% CI: 0.545–0.680, $P<0.001$).

Conclusion: Pregnant women in Shandong (China) have poor knowledge but positive attitudes and proactive practices toward intraspinal delivery analgesia during delivery. Compared with their spouses, pregnant women demonstrated better KAP toward intraspinal delivery analgesia. These findings highlight the need to provide education for spouses to support informed decision-making, while interpretations should consider the single-center scope and cultural context. Importantly, the results support integrating spouse-focused education into routine antenatal care.

Keywords: knowledge, attitude, practice, labor, intraspinal delivery analgesia, cross-sectional study

Introduction

Labor may result in severe pain for women, and labor pain varies as labor progresses.[1] Lower abdominal pain is common during delivery and may be accompanied by lower back, iliac crest, buttock, or thigh pain.[1–3] Intraspinal delivery analgesia is a neuraxial method that entails the placement of a local anesthetic directly in the epidural space.[4] Intraspinal delivery analgesia offers rapid-onset (within 5 min) and safe analgesia and allows for an easy prolongation of analgesia by injecting additional anesthetics through the catheter.[1,5,6] Still, there is a possibility of complications (like nausea, vomiting, backache, post-dural puncture headache, hypotension, low-frequency hearing loss, total spinal analgesia, neurological injury, spinal hematoma, and transient neurological issues).[4] Therefore, a careful weighing of the benefits and risks is necessary to obtain informed consent for the use of intraspinal delivery analgesia for labor pain. China has one of the highest cesarean section rates in the world,[7] which requires analgesia, usually of the neuraxial type. For vaginal delivery, using neuraxial analgesia is left at the patient's discretion after a comprehensive discussion with the physicians and according to the available resources.[1,8–10] The 2020 Chinese Expert Consensus on Intraspinal Analgesia for Childbirth points out that intraspinal analgesia is the preferred analgesia method for childbirth due to its precise analgesic effect and high safety for mothers and infants. The use of neuraxial analgesia for childbirth is supported by the guidelines from several authoritative organizations throughout the world, including the American Society of

Received: 18 June 2025
Accepted: 6 December 2025
Published: 13 December 2025

Anesthesiologists Task Force on Obstetric Anesthesia/Society for Obstetric Anesthesia and Perinatology (ASA/SOAP),[2] the American College of Obstetricians and Gynecologists (ACOG),[1] the Association of Anaesthetists of Great Britain and Ireland (AAGBI),[11] the Society of Obstetricians and Gynaecologists of Canada (SOGC),[12] and the French National Authority for Health/French College of Gynaecologists and Obstetricians/French College of Midwives,[13] among others.

Unfortunately, the general population has been reported to have several misconceptions about analgesia[14,15] that can hinder the informed consent process. Women refusing intraspinal delivery analgesia will feel the entire spectrum of childbirth pain, potentially leading to a poor childbirth experience.[16] Therefore, considering that women in labor may not be in the best set of minds to make informed consent about potentially morbid interventions, improving the women's knowledge before labor onset would be conducive to helping them make better-informed decisions when needed. Therefore, proper knowledge and understanding of intraspinal delivery analgesia in the antenatal period is necessary to make an informed choice. Previous studies indicated that women consult various sources of information on labor analgesia, including antenatal classes, family, friends, and healthcare providers,[17–19] but such information can be erroneous.

A knowledge, attitude, and practice (KAP) study involves a structured survey that can identify barriers to the implementation of a specific set of actions in a specific population,[20,21] allowing the design of interventions to remedy those gaps. Previous studies reported poor knowledge of analgesia for Cesarean section,[22,23] and similar studies were reported for intraspinal delivery analgesia for vaginal delivery.[24–26] Several misconceptions were also reported about analgesia in general.[14,15] An appropriate KAP toward analgesia has been shown to improve patient outcomes.[27] Still, there is a lack of data on intraspinal delivery analgesia for Chinese women in labor.

Furthermore, spouses play an important role in informed consent during labor. A study suggested that male engagement could be a strategy to improve the delivery and use of maternal, newborn, and child health services.[28] A study showed that males play crucial roles in improvements of maternal and newborn health through birth preparedness and complication readiness.[29]

Unlike prior KAP studies that mainly focused on cesarean section analgesia or were conducted in other regions,[22–26] the present study provides novel evidence from China by simultaneously investigating pregnant women and their spouses regarding intraspinal analgesia for vaginal delivery. Therefore, this study aimed to investigate the KAP of pregnant women and their spouses toward intraspinal delivery analgesia.

Materials and Methods

Study Design and Participants

This cross-sectional study recruited pregnant women and their spouses admitted to Qilu Hospital between February and May 2023. The individuals were included if they met the following criteria: 1) pregnant women ≥18 years old and their spouses and 2) married. Blind or illiterate people who could not complete the questionnaire were excluded. The study was approved by the Ethics Committee of Scientific Research of Shandong University Qilu Hospital (IRB #KYLL-202212-048). The participating individuals signed the informed consent form before filling in the questionnaire. The study was registered before the questionnaire survey in the Chinese Clinical Trial Registry (https://www.chictr.org.cn/showproj.html?proj=187401, ChiCTR2300068180, Principal investigator: Ping Dong, Date of registration: February 9, 2023).

Questionnaire

The questionnaire was designed by the investigators based on the Chinese Expert Consensus on Spinal Anesthesia, Expert Consensus on Labor Analgesia (2016 edition),[30] Chinese Expert Consensus on Obstetric Anesthesia (2017 edition), and ACOG Practice Bulletin No. 209: Obstetric Analgesia and Anesthesia.[1] The first draft was revised based on the opinions of five experts: two anesthesiology experts (one chief physician and one associate chief physician), two maternity experts (one chief physician and one associate chief physician), and a maternity nurse (deputy director nurse). A small-range distribution of questionnaires was carried out (n=44), and Cronbach's α was 0.915, indicating good reliability.

The final version of the questionnaire included 41 items encompassing four dimensions. The demographic, knowledge, attitude, and practice dimensions included 17, nine, 10, and five items. For the knowledge items, answering "well known" was awarded 2 points, "partially known" was scored 1 point, and "unknown" was attributed 0 points. The

knowledge score ranged from 0 to 18 points. The attitude items were scored using a 5-point Likert scale from very positive (5 points) to very negative (1 point). The attitude score ranged from 10 to 50 points. The practice items were also scored using a 5-point Likert scale from always (5 points) to never (1 point). P5 investigated the approaches to knowing about labor analgesia via intraspinal delivery analgesia; no points were assigned, and it was analyzed descriptively. Thus, the practice score ranged from 4 to 20 points. For each dimension, a score ≥70% of the total score indicated "good knowledge", "positive attitude", and "proactive practice".[31]

For distribution, the questionnaire was encoded in the Sojump website (https://www.wjx.cn/) to build the electronic questionnaires and obtain a QR code. The participants were recruited in obstetric clinics, rest areas, and maternity wards. The investigator informed the pregnant women and their spouses of the aim and content of the study and obtained their informed consent. Communication with each other and interference from spouses were avoided during answering. In order to avoid duplicates, a given IP address was restricted to the submission of a single questionnaire. All data were anonymized. After collecting all study data, quality checks were performed on the questionnaires by the research team. Questionnaires with logical errors (eg, an age of 5 years old) or with the same option selected throughout the entire questionnaire were rejected.

Sample Size

The formula

$$n = \left(\frac{Z_{1-\alpha/2}}{\delta}\right)^2 \times p \times (1-p)$$

was used to calculate the sample size; n is the sample size for each group, α is the type I error (typically 0.05), $Z_{1-\alpha/2}$=1.96, δ is the allowable error (typically 0.05), and p is set at 0.5 (which maximizes the value and ensures a sufficiently large sample size). The resulting sample size was 384, but factoring a response/validity rate of 80%, at least 480 valid questionnaires were needed.

Statistical Analysis

Stata 17.0 (Stata Corporation, College Station, TX, USA) was used for all analyses. The continuous variables were presented as means ± standard deviations (SD). The comparisons of two groups were performed using Student's *t*-test, while three or more groups were compared using ANOVA. The categorical variables were presented as n (%); the proportions were analyzed using the chi-squared test or Fisher's exact test. A stratified analysis was performed between the pregnant women and their spouses. The answers to KAP items between pregnant women and their spouses were compared through ANOVA, the chi-square test, or Fisher's exact test. Multivariable logistic regression was carried out with the "proactive practice" as the dependent variables to identify the factors independently associated with the practice scores. The variables with P<0.05 in the univariable logistic regression analyses were included in the multivariable regression analysis. A structural equation modeling (SEM) analysis was carried out based on the following proposed KAP model: 1) knowledge influences attitudes; 2) knowledge influences practice; 3) attitudes influence practice. Two-tailed P-values <0.05 were regarded as statistically significant.

Results

Participant Characteristics and KAP Scores

The investigators distributed 716 questionnaires, and 711 were collected for a response rate of 99.3%. In addition, 83 invalid questionnaires were excluded, and 628 valid questionnaires (88.33%) were included. There were 465 pregnant women and 163 spouses. The knowledge, attitude, and practice scores were 6.44 ± 6.04 (possible range: 0–18), 36.33 ± 5.87 (possible range: 10–50), and 15.71 ± 3.16 (possible range: 4–20), respectively (Table 1).

Among the pregnant women, the KAP scores were 6.75±6.01 (possible range 0–18, 37.50%; poor knowledge), 37.33 ±5.89 (possible range 10–50, 74.66%; positive attitudes), and 15.98±3.16 (possible range 4–20, 79.90%; proactive practice) (Table 1). Among the spouses, the KAP scores were 5.58±6.04 (possible range 0–18, 31.00%; poor knowledge), 33.49±4.78 (possible range 10–50, 66.98%; negative attitudes), and 14.94±3.03 (possible range 4–20, 74.70%; proactive

Table 1 Comparison of the KAP Between the Pregnant Woman and the Spouses According to the Demographic Characteristics

	N (%)	Knowledge Scores		Attitude Scores		Practice Scores	
		Mean ± SD	P	Mean ± SD	P	Mean ± SD	P
Total	628 (100)	6.44 ± 6.04		36.33 ± 5.87		15.71 ± 3.16	
Age			0.189		<0.001		0.003
18–30	267 (42.52)	6.88 ± 6.12		37.46 ± 6.06		16.15 ± 3.11	
31–35	246 (39.17)	6.33 ± 6.18		35.82 ± 5.57		15.55 ± 3.23	
>35	115 (18.31)	5.68 ± 5.48		34.82 ± 5.58		15.02 ± 2.98	
Gender			0.033		<0.001		<0.001
Male	163 (25.96)	5.58 ± 6.04		33.49 ± 4.78		14.94 ± 3.03	
Female	465 (74.04)	6.75 ± 6.01		37.33 ± 5.89		15.98 ± 3.16	
Marital status			0.080		0.691		0.174
Married	627 (99.68)	6.43 ± 6.03		36.34 ± 5.87		15.70 ± 3.16	
Widowed	1 (0.16)	17.00		34.00		20.00	
Relationship with pregnant women			0.033		<0.001		<0.001
Self	465 (74.04)	6.75 ± 6.01		37.33 ± 5.89		15.98 ± 3.16	
Spouse	163 (25.96)	5.58 ± 6.04		33.49 ± 4.78		14.94 ± 3.03	
Residence			0.006		<0.001		0.008
Urban	526 (83.76)	6.73 ± 6.02		36.72 ± 5.99		15.85 ± 3.14	
Non-urban	102 (16.24)	4.94 ± 5.95		34.35 ± 4.72		14.95 ± 3.14	
Education			<0.001		<0.001		<0.001
Senior high school and below	72 (11.46)	3.61 ± 5.05		34.06 ± 5.08		14.10 ± 3.21	
College/bachelor's	410 (65.29)	6.82 ± 6.04		36.28 ± 5.81		15.93 ± 3.11	
Master's or above	146 (23.25)	6.77 ± 6.14		37.61 ± 6.06		15.88 ± 3.06	
Working			0.018		0.833		0.461
Employed	511 (81.37)	6.72 ± 6.01		36.36 ± 5.85		15.75 ± 3.13	
Unemployed	117 (18.63)	5.25 ± 6.03		36.23 ± 5.95		15.51 ± 3.28	
Monthly income per capita, CNY			0.332		0.018		0.155
<2000	7 (1.11)	2.43 ± 3.64		32.00 ± 3.21		13.14 ± 2.04	
2000–5000	108 (17.20)	5.99 ± 6.17		34.97 ± 5.47		15.39 ± 3.15	
5000–10,000	288 (45.86)	6.52 ± 5.93		36.54 ± 5.74		15.82 ± 3.13	
10,000–20,000	155 (24.68)	6.49 ± 6.08		36.77 ± 6.29		15.71 ± 3.19	
>20,000	70 (11.15)	7.10 ± 6.32		37.06 ± 5.87		16.00 ± 3.23	
Gravidity			0.724		0.013		0.848
1	228 (49.35)	6.55 ± 6.11		37.05 ± 5.92		15.90 ± 3.09	
2	150 (32.47)	7.02 ± 5.99		36.57 ± 5.89		15.76 ± 3.12	
≥3	84 (18.18)	6.96 ± 6.02		34.85 ± 5.48		15.99 ± 3.13	
Missing	166	5.51 ± 5.94		35.90 ± 5.84		15.25 ± 3.27	
Para			0.108		<0.001		0.055
0	228 (49.78)	6.53 ± 5.83		37.80 ± 5.96		16.23 ± 2.95	
1	193 (42.14)	6.73 ± 6.13		35.70 ± 5.63		15.51 ± 3.20	
≥2	37 (8.08)	8.78 ± 6.84		33.24 ± 5.08		16.05 ± 3.33	
Missing	170	5.49 ± 5.89		35.76 ± 5.72		15.16 ± 3.25	
Abortion			0.401		0.135		0.221
Yes	241 (38.38)	6.05 ± 5.90		36.13 ± 5.72		15.54 ± 3.12	
No	381 (60.67)	6.70 ± 6.08		36.53 ± 5.95		15.66 ± 3.17	
Unclear	6 (0.96)	5.67 ± 8.78		32.00 ± 5.25		13.67 ± 3.72	
Trimester			0.011		0.327		0.392
First	27 (5.06)	3.93 ± 4.88		36.41 ± 6.59		15.19 ± 3.92	
Second	107 (20.04)	5.72 ± 5.60		35.80 ± 5.75		15.65 ± 3.07	
Third	400 (74.91)	6.95 ± 6.11		36.76 ± 5.90		15.92 ± 3.04	

(*Continued*)

Table 1 (Continued).

	N (%)	Knowledge Scores		Attitude Scores		Practice Scores	
		Mean ± SD	P	Mean ± SD	P	Mean ± SD	P
Health insurance for pregnant women			0.184		0.503		0.119
No	7 (1.11)	3.43 ± 4.61		34.86 ± 6.54		13.86 ± 3.80	
Yes	621 (98.89)	6.48 ± 6.05		36.35 ± 5.86		15.73 ± 3.15	
Pregnancy complications (multiple options)							
Hypertensive syndrome of pregnancy	19 (3.03)	8.00 ± 6.58		35.37 ± 5.79		16.05 ± 3.27	
Gestational diabetes	58 (9.24)	7.64 ± 5.85		37.86 ± 6.18		16.52 ± 2.95	
Heart disease during pregnancy	0						
Placenta previa	18 (2.87)	9.28 ±6.41		37.39 ± 5.49		16.33 ± 2.74	
Others	541 (86.15)	6.20 ± 6.02		36.17 ± 5.84		15.58 ± 3.17	
Underwent labor analgesia via intraspinal delivery analgesia			-		-		-
Yes	107 (17.04)	9.33 ± 6.27		36.45 ± 6.06		16.40 ± 3.25	
No	431 (68.63)	6.23 ± 5.88		36.44 ± 5.89		15.70 ± 3.15	
Unclear	90 (14.33)	4.03 ± 5.15		35.70 ± 5.55		14.93 ± 2.93	
Underwent a cesarean section			<0.001		0.542		0.005
Yes	149 (23.73)	6.89 ± 5.99		36.62 ± 6.01		15.85 ± 3.28	
No	453 (72.13)	6.42 ± 6.01		36.32 ± 5.86		15.72 ± 3.10	
Unclear	26 (4.14)	4.27 ± 6.50		35.04 ± 5.17		14.65 ± 3.33	
Underwent intraspinal delivery analgesia (except for childbirth)			0.122		0.446		0.203
Yes	67 (10.67)	9.15 ± 6.38		36.72 ± 6.25		15.90 ± 3.50	
No	519 (82.64)	6.29 ± 5.92		36.45 ± 5.82		15.77 ± 3.11	
Unclear	42 (6.69)	4.00 ± 5.58		34.36 ± 5.57		14.64 ± 3.03	
Labor analgesia via intraspinal delivery analgesia during delivery			<0.001		<0.001		<0.001
Yes	259 (41.24)	9.22 ± 6.16		38.41 ± 6.16		17.97 ± 2.18	
No	35 (5.57)	5.00 ± 5.68		32.37 ± 5.08		13.06 ± 2.83	
The delivery schedule has not yet been determined	290 (46.18)	4.78 ± 5.04		35.61 ± 5.17		14.42 ± 2.67	
Unclear	44 (7.01)	2.20 ± 4.72		32.00 ± 3.58		13.02 ± 2.77	

practice) (Table 1). Compared with their spouses, the pregnant women had significantly higher knowledge (P=0.033), attitude (P<0.001), and practice (P<0.001) scores (Table 1).

Distribution of KAP Response

Among the knowledge items, the item with the highest correctness rate was K1 (58.06% in pregnant women and 54.60% in spouses; "Labor analgesia follows the principle of voluntary parturient. Parturient who choose vaginal delivery can voluntarily receive intraspinal delivery analgesia as long as there are no contraindications to intraspinal delivery block (such as intracranial hypertension and abnormal coagulation function)"), while the question with the lowest correctness rate was K4 (37.42% in the pregnant women and 33.13% in spouses; "After evaluation by obstetricians, parturient with a cicatricial uterus, gestational hypertension, and preeclampsia can also receive intraspinal delivery analgesia for labor analgesia"). The pregnant women knew well that "Intraspinal delivery analgesia is preferred for labor analgesia" (29.68% vs 17.79%, P=0.006) and "Before labor analgesia via intraspinal delivery analgesia, parturient must undergo systematic evaluation" (38.28% vs 26.38, P=0.024) than their spouses (Table 2).

There were significant differences in all attitude items between the pregnant women and their spouses (all P<0.05). The pregnant women had significantly positive practices compared with their spouses in P3 and P4 (all P<0.05)

Table 2 Knowledge Dimension

Knowledge	Well Known, n (%)		Partially Known, n (%)		Unknown, n (%)		P
	Pregnant Woman	Spouses	Pregnant Woman	Spouses	Pregnant Woman	Spouses	
K1. Labor analgesia follows the principle of voluntary parturients. Parturients who choose vaginal delivery can voluntarily receive intraspinal delivery analgesia if there are no contraindications to intraspinal delivery analgesia (such as intracranial hypertension and abnormal coagulation function);	151 (32.47)	43 (26.38)	119 (25.59)	46 (28.22)	195 (41.94)	74 (45.4)	0.349
K2. Intraspinal delivery analgesia is preferred for labor analgesia;	138 (29.68)	29 (17.79)	119 (25.59)	41 (25.15)	208 (44.73)	93 (57.06)	**0.006**
K3. Before labor analgesia via intraspinal delivery analgesia, parturients must undergo systematic evaluation;	178 (38.28)	43 (26.38)	95 (20.43)	40 (24.54)	192 (41.29)	80 (49.08)	**0.024**
K4. After evaluation by obstetricians, parturients with a cicatricial uterus, gestational hypertension, and preeclampsia can also receive intraspinal delivery analgesia for labor analgesia.	89 (19.14)	26 (15.95)	85 (18.28)	28 (17.18)	291 (62.58)	109 (66.87)	0.577
K5. Intraspinal delivery analgesia is the same technique used for painless delivery and cesarean section, but with different drug concentrations;	89 (19.14)	24 (14.72)	92 (19.78)	33 (20.25)	284 (61.08)	106 (65.03)	0.444
K6. During labor analgesia via intraspinal delivery analgesia, if an emergency transfer to cesarean section is needed, a high concentration of anesthetics should be injected into the intraspinal delivery catheter as soon as possible to meet the analgesia requirements of cesarean section.	90 (19.35)	24 (14.72)	90 (19.35)	30 (18.4)	285 (61.29)	109 (66.87)	0.353
K7. After entering labor, regardless of the cervical dilatation degree, as long as the parturients desire labor analgesia, the intraspinal labor analgesia can be performed at any stage of labor if the physician considers that there are no contraindications.	100 (21.51)	28 (17.18)	101 (21.72)	34 (20.86)	264 (56.77)	101 (61.96)	0.425
K8. Parturients who plan to undergo intraspinal delivery analgesia for labor analgesia should avoid ingesting solid food after entering the delivery room but can drink high-energy, non-slag drinks;	128 (27.53)	31 (19.02)	104 (22.37)	45 (27.61)	233 (50.11)	87 (53.37)	0.078
K9. After intraspinal delivery analgesia for labor, attention should be paid to recovery and the management of related complications.	144 (30.97)	35 (21.47)	118 (25.38)	46 (28.22)	203 (43.66)	82 (50.31)	0.068

Notes: The KAP items were directly translated from Chinese without translation validation. Therefore, they are for indicative purposes only. Bold values indicate statistical significance ($P < 0.05$).

(Table 3). Pregnant women and their spouses mainly obtain information about intraspinal delivery analgesia through an introduction from medical staff (53.66%), the internet (47.29%), and friend exchange (37.74%).

Multivariable Analyses

Among the pregnant women, the knowledge scores (OR=1.149, 95% CI: 1.101–1.200, P<0.001) and the attitude scores (OR=1.090, 95% CI: 1.044–1.138, P<0.001) were independently associated with the proactive practice (Table 4). Among the spouses, the knowledge scores (OR=1.446, 95% CI: 1.246–1.677, P<0.001) and the attitude scores (OR=1.136, 95% CI: 1.002–1.289, P=0.050) were independently associated with proactive practice (Table 5).

Structural Equation Modeling

The SEM model (Figure 1) showed adequate model fit (Table S1). The knowledge positively influenced both attitude (β=0.425, 95% CI: 0.352–0.497, P<0.001) and practice (β=0.580, 95% CI: 0.517–0.644, P<0.001), and attitude positively influenced practice (β=0.612, 95% CI: 0.545–0.680, P<0.001). The SEM also indicated an indirect effect on practice (β=0.260, 95% CI: 0.208–0.302, P<0.001). (Table 6).

Discussion

The present study suggests that pregnant women had poor knowledge, positive attitudes, and proactive practice toward intraspinal delivery analgesia during labor. In addition, compared with their spouse, the pregnant women had higher knowledge, attitude, and practice scores. The knowledge and attitude scores were independently associated with the practice scores. This study identified several gaps and misconceptions that could be improved through patient education.

Table 3 Attitude and Practice Dimension

	Extremely		Relatively		Neutral		Relatively Not		Extremely Not		P
	Pregnant Woman	Spouses	Pregnant Woman	Spouses	Pregnant Woman	Spouses	Pregnant Woman	Spouses	Pregnant Woman	Spouses	
A1. You think pregnant women must use various methods to relieve pain during delivery.	338 (72.69)	88 (53.99)	90 (19.35)	54 (33.13)	31 (6.67)	20 (12.27)	3 (0.65)	1 (0.61)	3 (0.65)	0 (0)	<0.001
A2. You are concerned about the impact of intraspinal delivery analgesia drugs on maternal health.	72 (15.48)	46 (28.22)	91 (19.57)	43 (26.38)	198 (42.58)	70 (42.94)	83 (17.85)	4 (2.45)	21 (4.52)	0 (0)	<0.001
A3. You are concerned about intraspinal delivery analgesia drugs' impact on labor duration.	64 (13.76)	37 (22.7)	82 (17.63)	40 (24.54)	211 (45.38)	75 (46.01)	88 (18.92)	10 (6.13)	20 (4.3)	1 (0.61)	<0.001
A4. You are concerned about the impact of intraspinal delivery analgesia drugs on postpartum breastfeeding.	55 (11.83)	41 (25.15)	60 (12.9)	27 (16.56)	193 (41.51)	82 (50.31)	132 (28.39)	11 (6.75)	25 (5.38)	2 (1.23)	<0.001
A5. You are concerned about intraspinal delivery analgesia drugs' impact on the newborn's development and health.	55 (11.83)	41 (25.15)	63 (13.55)	27 (16.56)	190 (40.86)	79 (48.47)	132 (28.39)	14 (8.59)	25 (5.38)	2 (1.23)	<0.001
A6.1 (Pregnant woman) You want to reduce pain during delivery via intraspinal delivery analgesia. A6.2 (Pregnant Woman's Family) You want your pregnant woman to be able to reduce pain via intraspinal delivery analgesia.	241 (51.83)	64 (39.26)	119 (25.59)	48 (29.45)	100 (21.51)	51 (31.29)	3 (0.65)	0 (0)	2 (0.43)	0 (0)	0.025
A7. You believe that choosing intraspinal delivery analgesia for labor analgesia is the right of pregnant women, and family members should not interfere on other grounds.	291 (62.58)	71 (43.56)	96 (20.65)	39 (23.93)	72 (15.48)	50 (30.67)	4 (0.86)	3 (1.84)	2 (0.43)	0 (0)	<0.001
A8. You think choosing intraspinal delivery analgesia for labor analgesia is a sign of weakness.	27 (5.81)	12 (7.36)	17 (3.66)	10 (6.13)	65 (13.98)	52 (31.9)	162 (34.84)	41 (25.15)	194 (41.72)	48 (29.45)	<0.001
A9. You believe intraspinal delivery analgesia for labor analgesia is beneficial in reducing postpartum depression.	170 (36.56)	37 (22.7)	119 (25.59)	41 (25.15)	153 (32.9)	82 (50.31)	20 (4.3)	2 (1.23)	3 (0.65)	1 (0.61)	<0.001
A10. You believe relevant government departments should increase efforts to popularize public education on analgesia during delivery.	271 (58.28)	74 (45.4)	114 (24.52)	42 (25.77)	74 (15.91)	47 (28.83)	3 (0.65)	0 (0)	3 (0.65)	0 (0)	0.003
P1. You take the initiative to consult your doctor for advice on labor analgesia with intraspinal delivery analgesia.	165 (35.48)	45 (27.61)	109 (23.44)	50 (30.67)	164 (35.27)	60 (36.81)	24 (5.16)	8 (4.91)	3 (0.65)	0 (0)	0.208
P2.1 (Pregnant women) If you are pregnant again and are about to give birth and there are no relevant contraindications, will you choose intraspinal delivery analgesia for labor analgesia?	232 (49.89)	–	102 (21.94)	–	114 (24.52)	–	16 (3.44)	–	1 (0.22)	–	
P2.2 (Spouses) Assuming that your wife is pregnant again and is about to give birth and there are no relevant contraindications, will you support her in intraspinal delivery analgesia for labor analgesia?	–	52 (31.9)	–	43 (26.38)	–	64 (39.26)	–	4 (2.45)	–	0 (0)	
P3. Would you recommend other relatives and friends who are about to give birth to consider intraspinal delivery analgesia for labor analgesia?	204 (43.87)	34 (20.86)	119 (25.59)	47 (28.83)	127 (27.31)	76 (46.63)	14 (3.01)	6 (3.68)	1 (0.22)	0 (0)	<0.001
P4. You actively understand the knowledge of intraspinal delivery analgesia for labor analgesia.	134 (28.82)	34 (20.86)	145 (31.18)	38 (23.31)	158 (33.98)	81 (49.69)	24 (5.16)	9 (5.52)	4 (0.86)	1 (0.61)	0.010

Notes: The KAP items were directly translated from Chinese without translation validation. Therefore, they are for indicative purposes only.

https://doi.org/10.2147/PPA.S548078

Table 4 Multivariable Analysis of the Pregnant Women for Practice

Practice	Univariable		Multivariable	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**
Knowledge	1.165 (1.119–1.213)	<0.001	1.149 (1.101–1.200)	<0.001
Attitude	1.121 (1.076–1.169)	<0.001	1.090 (1.044–1.138)	<0.001
Age				
18–30	REF			
31–35	1.180 (0.730–1.908)	0.50		
>35	0.583 (0.268–1.269)	0.17		
Place of residence				
Urban	REF			
Non-urban	0.560 (0.276–1.138)	0.11		
Educational level				
Senior high school and below	REF			
College/bachelor's	1.452 (0.652–3.237)	0.36		
Master's or above	1.578 (0.653–3.815)	0.31		
Working status				
Employed	REF			
Unemployed	0.816 (0.456–1.459)	0.49		
Average monthly income per capita, CNY				
<2000	REF			
2000–5000	409,512,038.132 (0-.)	>0.99		
5000–10,000	321,322,617.734 (0-.)	>0.99		
10,000–20,000	538,432,494.581 (0-.)	>0.99		
>20,000	628,171,243.678 (0-.)	>0.99		
Gravidity				
1	REF			
2	0.917 (0.499–1.684)	0.78		
≥3	1.302 (0.669–2.535)	0.44		
Missing	1.026 (0.566–1.861)	0.93		
Para				
0	REF			
1	1.026 (0.595–1.770)	0.93		
≥2	1.390 (0.543–3.555)	0.49		
Missing	0.910 (0.501–1.653)	0.76		
Abortion				
Yes	REF			
No and unclear	0.978 (0.617–1.551)	0.93		
Health insurance for pregnant women				
No	REF			
Yes	0.987 (0.109–8.931)	0.99		
Have you (or your family members) ever undergone labor analgesia via intraspinal delivery analgesia				
Yes	REF			
No and unclear	0.657 (0.379–1.138)	0.13		
Have you (or your family members) ever undergone a cesarean section?				
Yes	REF			
No and unclear	0.903 (0.546–1.493)	0.69		
Have you ever undergone intraspinal delivery analgesia (except for childbirth)?				
Yes	REF		REF	
No and unclear	0.573 (0.304–1.077)	0.08	0.839 (0.408–1.724)	0.63

Notes: Bold variables indicate independent predictors retained in the multivariable analysis.

Table 5 Multivariable Analysis of the Spouses for Practice

Practice	Univariable		Multivariable	
	OR (95% CI)	**P**	**OR (95% CI)**	**P**
Knowledge	1.425 (1.254–1.619)	<0.001	1.446 (1.246–1.677)	<0.001
Attitude	1.150 (1.050–1.261)	<0.001	1.136 (1.002–1.289)	0.050
Age				
18–30	REF			
31–35	0.660 (0.233–1.869)	0.43		
>35	0.350 (0.090–1.356)	0.13		
Place of residence				
Urban	REF			
Non-urban	1.304 (0.400–4.258)	0.66		
Educational level				
Senior high school and below	REF			
College/bachelor's	2.374 (0.290–19.417)	0.42		
Master's or above	3.706 (0.422–32.515)	0.24		
Working status				
Employed	REF			
Unemployed	1.225 (0.326–4.602)	0.76		
Average monthly income per capita, CNY				
<2000	REF			
2000–5000	190,054,455.769 (0-.)	>0.99		
5000–10,000	164,284,360.072 (0-.)	>0.99		
10,000–20,000	316,068,823.182 (0-.)	>0.99		
>20,000	285,081,683.654 (0-.)	>0.99		
Gravidity				
1	REF			
2	1.069 (0.321–3.555)	0.91		
≥3	1.104 (0.208–5.874)	0.91		
Missing	0.705 (0.216–2.304)	0.56		
Para				
0	REF			
1	0.861 (0.261–2.845)	0.81		
≥2	2.732 (0.583–12.799)	0.20		
Missing	0.531 (0.150–1.879)	0.33		
Abortion				
Yes	REF			
No and unclear	0.938 (0.351–2.506)	0.90		
Health insurance for pregnant women				
No	REF			
Yes	0 (0-.)	>0.99		
Have you (or your family members) ever undergone labor analgesia via intraspinal delivery analgesia				
Yes	REF		REF	
No and unclear	0.234 (0.081–0.672)	0.01	0.449 (0.097–2.083)	0.31
Have you (or your family members) ever undergone a cesarean section?				
Yes	REF			
No and unclear	0.432 (0.140–1.332)	0.14		
Have you ever undergone intraspinal delivery analgesia (except for childbirth)?				
Yes	REF			
No and unclear	0.677 (0.137–3.338)	0.63		

Notes: Bold variables indicate independent predictors retained in the multivariable analysis.

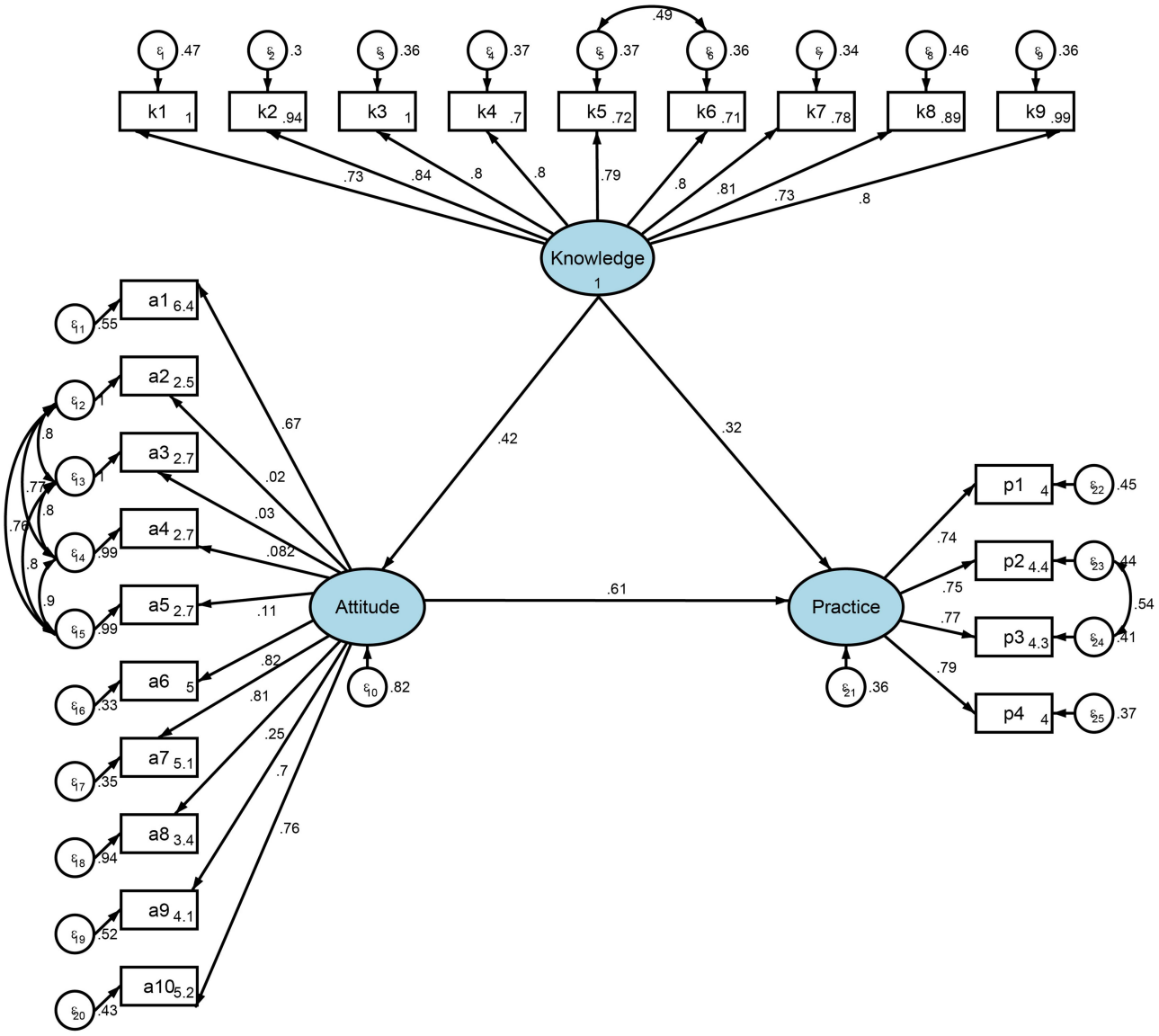

Figure 1 Schematic representation of the structural equation modeling analysis.

The results may help design interventions to improve the KAP of women and spouses toward intraspinal delivery analgesia, especially for spouses, and help them make more informed decisions.

This study showed poor knowledge of all knowledge items, as supported by previous studies in cesarean section and vaginal delivery.[22,26,32] Similarly, several surveys conducted in different countries have also reported limited awareness

Table 6 SEM Results

Model Paths	Total Effects		Direct Effect		Indirect Effect	
	β(95% CI)	P	β(95% CI)	P	β(95% CI)	P
Attitude						
Knowledge	0.425 (0.352, 0.497)	<0.001	0.425 (0.352, 0.497)	<0.001		
Practice						
Knowledge	0.580 (0.517, 0.644)	<0.001	0.320 (0.248, 0.392)	<0.001	0.260 (0.208, 0.312)	<0.001
Attitude	0.612 (0.545, 0.680)	<0.001	0.612 (0.545, 0.680)	<0.001		

and misconceptions about neuraxial analgesia among pregnant women. For example, studies from Saudi Arabia and India showed that only a minority of women demonstrated adequate knowledge about epidural or spinal analgesia, and misconceptions about safety were prevalent.[23,25] In contrast, a survey from the Middle East reported relatively positive attitudes despite poor knowledge, which is consistent with our findings.[24] Furthermore, some recent investigations emphasized the role of family members, especially husbands, in influencing maternal decisions about labor analgesia, highlighting the need to engage spouses in antenatal education.[28,29] Still, the attitudes and practice scores were relatively high, suggesting that the women and their spouses were willing to undergo intraspinal delivery analgesia despite a poor knowledge of its mechanisms, exact effects, benefits, and risks. It also suggests that they would accept what the physicians would offer them, contrary to the informed consent principle. The fear of labor and delivery pain probably plays an important role in these results.[33,34] Significant differences were observed between the pregnant women and their spouses for all attitude items, with the women scoring higher for the items involving pain and its management. In contrast, the spouses scored higher for the items involving potential risks to their wives' health. Similar patterns were observed for the practice items. The women are the ones experiencing the pain during delivery, and it is normal that pain and its management are their main concern.[35,36] On the other hand, spouses do not experience physical pain during delivery, but they are concerned about the health and well-being of their wives and babies. Still, spouses are involved in the informed consent process. Indeed, they are not in physical pain and might be in a better set of mind to understand what the physician is saying and convey the information to the woman in a manner that can be easier for the woman to understand.[28,29,37] Male engagement improves maternal and newborn outcomes,[28] and males contribute to the delivery process through birth preparedness, complication readiness, and communication with the women.[29] A report from India concluded that males' participation in maternal healthcare should be emphasized, and the information provided to men should be more comprehensive.[38] Hence, improving the knowledge of the spouses is equally important. Practical strategies may include integrating spouse education into routine antenatal care visits, offering targeted sessions within childbirth education classes, and developing digital resources or printed materials specifically designed for male partners. Such approaches could facilitate informed joint decision-making and enhance maternal and newborn outcomes.

Since an appropriate KAP toward analgesia has been shown to improve patient outcomes,[27] improving the women's and their spouses' knowledge should improve the delivery outcomes, as suggested by the positive association and relationships between knowledge, attitude, and practice in the multivariable and SEM analyses. Some previous studies showed that improving knowledge and attitudes toward pain improves its management, but those studies were not performed specifically for the delivery of pain.[39,40] In addition, the KAP scores were all correlated, indicating that improving knowledge should also translate into better attitude and practice scores. The knowledge and attitude scores were independently associated with the practice scores in pregnant women and their spouses. The KAP theory enunciates that knowledge is the foundation of practice, while attitude is the strength driving practice.[20,21] Therefore, improving knowledge could improve attitude and practice. Healthcare providers like nurses also play a central role in pain management as they are primary workers in the ward and the first line of services to pregnant women. They are also primary healthcare information sources and can help in the informed consent process. Improving the nurses' knowledge is also conducive to improving pain management in patients.[41]

No demographic, socioeconomic, or clinical factors were associated with the KAP scores here, which is surprising considering that, for example, socioeconomic status is generally considered associated with healthcare literacy.[42] Additional studies would be necessary to clarify the issue. Nevertheless, for now, the results suggest that all women and spouses might need interventions to improve their KAP toward intraspinal delivery analgesia during delivery.

Some limitations of this study must be acknowledged. It was performed at a single center, resulting in a relatively small sample size. Not all spouses were enrolled, leading to an imbalance between the two groups. It was a cross-sectional study, and causality could not be determined. SEM analyses were used to explore possible relationships among variables, but the suggested causality is only statistical, and such results must be taken cautiously.[43–45] The results could nevertheless serve as a kind of baseline to evaluate future interventions. Finally, all KAP studies are at risk of the social desirability bias.[46,47] However, considering that the attitude and practice scores were high while the knowledge scores were poor, this bias is unlikely to have significantly affected our results. Additionally, the questionnaire was originally designed and administered in Chinese. The English version presented in this article was directly translated for reporting

purposes, so translation validation could not be conducted in this study. Future research applying this tool in English-speaking contexts should perform proper validation before use.

Pregnant women in Shandong (China) have poor knowledge but positive attitudes and proactive practices toward intraspinal delivery analgesia during delivery. Interventions should be designed and implemented to improve the KAP of women toward intraspinal delivery analgesia during delivery. Compared with their spouse, the pregnant women had higher knowledge, attitude, and practice scores. Since males are involved in delivery by laying support to the women, the results highlight the need to provide education for spouses, while the single-center scope and cultural context should be acknowledged.

Data Sharing Statement

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

Ethics Approval and Consent to Participate

This work has been carried out in accordance with the Declaration of Helsinki (2000) of the World Medical Association. The authors confirm that all methods were performed in accordance with the relevant guidelines. The study was registered before the questionnaire survey in the Chinese Clinical Trial Registry (https://www.chictr.org.cn/showproj.html?proj=187401, ChiCTR2300068180, Principal investigator: Ping Dong, Date of registration: February 9, 2023).

Author Contributions

All authors made a significant contribution to the work reported, whether that is in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; have agreed on the journal to which the article has been submitted; and agree to be accountable for all aspects of the work.

Funding

There is no funding to report.

Disclosure

The authors report no conflicts of interest in this work.

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