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Original Article

Effect of an evidence-based activity management program on delivery outcomes in pregnant women after intraspinal labor analgesia

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Abstract: Objective: To investigate the effect of an evidence-based activity management program for pregnant women after intraspinal labor analgesia based on their delivery outcomes. Methods: A prospective study was conducted in 96 pregnant women who received intraspinal labor analgesia in our hospital. The control group (48 cases) received routine nursing care after analgesia, and the intervention group (48 cases) received evidence-based activity management program after analgesia. The labor time, sense of birth control, physiological and psychological stress reactions, analgesic effect, delivery outcome and early postpartum pelvic floor function were compared between the two groups. Results: Compared with the control group, the first, second and third stages of labor time and the total labor time of the intervention group were significantly shorter, while the Labor Agentry Scale (LAS) score was significantly higher ($P<0.05$). Compared with the control group, the diastolic blood pressure, systolic blood pressure, heart rate, Visual Analogue Scale (VAS) score, Self-Rating Anxiety Scale (SAS) score and Self-Rating Depression Scale (SDS) score of the intervention group were significantly lower ($P<0.05$). The total analgesic rate of the intervention group was significantly higher than that of the control group (95.83% vs. 79.17%, $P<0.05$). The overall incidence of postpartum hemorrhage, perineal laceration, lateral episiotomy, fetal distress and neonatal asphyxia in the intervention group was significantly lower than that of the control group (16.67% vs. 35.42%, $P<0.05$). The incidence of pelvic organ prolapse (POP) and pelvic floor dysfunction in the intervention group were significantly lower than those in the control group ($P<0.05$). Conclusion: An evidence-based activity management program for pregnant women after intraspinal labor analgesia can effectively shorten the labor time, strengthen the analgesic effect, reduce the physiological and psychological stress reactions, increase the sense of control during birth and improve the delivery outcome as well as early pelvic floor function.

Keywords: Evidence-based, intraspinal labor analgesia, activity management, delivery outcome

Introduction

Labor pain refers to a physiological phenomenon caused by uterine contraction during delivery, usually accompanied with anxiety, tension and a series of adverse emotions. Moreover, severe pain can affect neuroendocrine responses, leading to vasoconstriction, acidosis and decrease of placental blood flow, which significantly increases the risk of parturition and affects the pregnant women's postpartum life quality and the prognosis of newborns [1, 2]. Therefore, scientific labor analgesia is significant in reducing the incidence of perinatal maternal and infant complications and relieving pain. Intraspinal nerve block anesthesia is a common method of analgesia during labor. Analgesic or narcotic drugs are injected into the vertebral canal space to weaken the sensory nerve excitement induced by nerve conduction and block the conductive function of spinal nerves, so as to relieve the pain and reduce the cesarean section rate [3, 4]. However, due to the dynamic delivery process, lying in a supine position on the bed for a long time can limit the pelvis's plasticity, increase the resistance of the fetus descending and prolong the labor time [5]. A study has found that ambulation after intraspinal analgesia helps deliver the fetus be born faster and reduces medical inter-

vention [6]. However, some studies are still cautious about the view of maternal activities during labor.

Evidence-based nursing is a nursing intervention model based on scientific evidence. On the premise of meeting the patients' wishes and needs, evidence-based nursing clarifies any evidence-based problems and combines the evidence-based and scientific research results, as well as clinical experience and patients' specific conditions to develop a standardized nursing plan, which can help make the nursing work well-founded and accelerate the rehabilitation process of patients [7, 8]. At present, there are many reports on the application of evidence-based nursing in vaginal delivery, but related content of evidence-based nursing practice in intraspinal delivery analgesia are limited. Therefore, this study analyzes the effect of an evidence-based activity management program for pregnant women after intraspinal labor analgesia on delivery outcomes, hoping to provide evidence for clinical practice. The research report is as follows.

Materials and methods

General information

This study is in line with the relevant requirements of the World Medical Association Declaration of Helsinki. Ninety-six pregnant women who received intraspinal labor analgesia in Guangzhou Women and Children's Medical Center from May 2020 to September 2020 were recruited in this prospective study. They were randomly divided into the control group and the intervention group, with 48 cases in each group. All patients agreed to participate in this study, and the Ethics Committee of Guangzhou Women and Children's Medical Center approved this study.

Inclusion criteria

The inclusion criteria were: primiparas with a full-term (gestational age ≥37 weeks) with head-presentation and singleton pregnancy; No abnormality in the prenatal examination; Normal comprehension, cognition or communication ability; Meeting the indications of vaginal delivery [9]. Agreeing to participate in the research and signing of the informed consent; with good compliance.

The exclusion criteria were: pregnancy accompanied with severe pregnancy complications such as gestational diabetes mellitus and hypertensive disorder complicating pregnancy; premature rupture of membranes; pregnancy combined with immune system diseases and hematological diseases; pregnancy accompanied with cardio-cerebrovascular diseases; disturbance of walking; normal communication ability affected by visual and hearing impairment; inability to tolerate intraspinal delivery analgesia; conversion to a cesarean section after failure of vaginal trial delivery.

Methods

Control group: The control group was given routine nursing after analgesia and guided to properly use abdominal pressure to prevent physical exertion. The vital signs were closely monitored, and the dynamic changes of fetal heart rate, uterine contraction and labor process were observed. Psychological counseling for pregnant women was provided to enhance their confidence in spontaneous labor. Half way in a lying position or supine position for labor were taken, and water and nutrition were supplied in a timely manner during the delivery. Pregnant women were guided to carry out breathing relaxation exercises to reduce tension.

Intervention group: The intervention group received the evidence-based activity management program after analgesia. The specific measures are described below.

Firstly, the evidence-based team was built. Team members included: a director and a deputy director of the nursing department (1 person each), a deputy director of the obstetrics department (1 person), a director and deputy director of the anesthesia department (1 person each), a senior practice midwife (1 person), and nurses (3 people). The nursing department director was the team leader, responsible for the design of the scheme and the screening and retrieval of evidence-based results. The managers of the three departments, obstetrics, anesthesia and nursing, were responsible for data collection, personnel deployment and discipline suggestions.

Secondly, evidence-based problems were determined. The data of pregnant women who received intraspinal labor analgesia in Guang-

zhou Women and Children's Medical Center in the past were collected, and the pain degree and vital signs of the pregnant women entering the group were comprehensively evaluated. The nursing practice process of intraspinal labor analgesia was sorted out, and the problems to be solved were put forward, such as "can the pregnant women get out of bed after receiving intraspinal labor analgesia?", "what is the best activity time?", "what kind of body position should be taken during labor?" and "what is the area of activity?".

Thirdly, evidence-based support. Keywords were determined according to the evidence-based problems mentioned above, which were "intraspinal analgesia", "labor analgesia", "activity management", "delivery outcome", etc. Keywords were input into "CNKI", "VIP", "Wanfang", "PubMed", "Embase" and other literature retrieval databases to query relevant literature. According to the hospital environment, the actual situation of pregnant women and the Ochrane risk bias assessment tool, the validity, practicability and authenticity of the literature were evaluated to find the best literature support.

Fourthly, evidence-based practice. Before the activity, the Bromage score (0 for no motor nerve block, 1 for inability to lift legs, 2 for inability to bend knees, 3 for inability to bend ankle joints) was used by the team members to evaluate the pregnant women's walking ability [10]. They could not get out of bed unless the following conditions were met at the same time [11]. (1) Midwives and obstetricians did not object to the pregnant woman walking; (2) The fetal heart rate within 30 minutes after analgesia was within the normal range; (3) The pregnant woman has been evaluated by anesthesiologist or midwife and was allowed to walk. Pregnant women were encouraged to get out of bed and choose a comfortable position in the process of labor, such as an upright walking position (walking slowly around the delivery room with the help of family members), squatting position (being guided to squat by the wall, stick the delivery ball against the wall and put the top of the delivery ball at the scapula level), sitting position (sitting on the delivery ball, shaking the pelvis and slightly bouncing up and down), kneeling position (kneeling on the cushion, putting the delivery ball on the cushion, leaning forward and holding the delivery ball with both hands, leaning forward slightly and leaning her head against the ball) and standing position (standing beside the bed and putting the delivery ball on the bed, with the same posture as that of kneeling position). The delivery ball's diameter, duration and posture were determined according to the pregnant woman's situation, and the pregnant woman was accompanied by family members, partners or midwives during activity. The activity area was better not to occur beyond the delivery room.

Outcome measures

Primary outcome measures: (1) Duration of labor. The first, second and third stages of labor time and total labor time were recorded.

(2) Delivery outcome. The incidences of postpartum hemorrhage, perineal laceration, lateral episiotomy, fetal distress and neonatal asphyxia were counted. Postpartum hemorrhage: the amount of vaginal delivery bleeding was more than or equal to 500 mL within 24 hours after delivery. Neonatal asphyxia: the Apgar score of the newborn was used to evaluate the five physical signs, including muscle pulse, tension, appearance, frowning movement (i.e., the response to stimulation) and respiration, 0 to 10 points. An Apgar score of fewer than 8 points was regarded as neonatal asphyxia [12].

(3) Sense of birth control. Two hours after delivery, the Labor Agentry Scale (LAS) was used to evaluate the sense of control during birth. There were 29 items, all of which were scored by 1 to 7 points with 7 grades. The total scores of the scale were 29 to 203 points. Higher scores indicated a good sense of control during birth and positive emotions [13].

Secondary outcome measures: (1) Blood pressure, heart rate and pain degree. Ambulatory blood pressure detector (model: iE70, manufacturer: Wuhan Zhongqi Biomedical Electronics Co., Ltd., China) was used to measure the diastolic blood pressure, systolic blood pressure and heart rate at 5 min and 60 min after analgesia. Meanwhile, Visual Analogue Scale (VAS) was used to evaluate the degree of pain [14]. The score range was 0 to 10, 0 for no pain, 10 for severe pain.

Table 1. Comparison of general information between two groups ($\bar{x}$ ± sd)

Group	Age (years)	Gestational weeks (week)	Body mass index (kg/m^2)	Bromage score before activity
Control group (n=48)	26.5±3.1	40.13±0.84	26.54±2.74	1.54±0.22
Intervention group (n=48)	26.7±4.2	39.94±0.91	27.36±3.11	1.62±0.24
t	0.265	1.063	1.371	1.702
P	0.792	0.290	0.174	0.092

Table 2. Comparison of labor time and LAS score between two groups ($\bar{x}$ ± sd)

Group	Control group (n=48)	Intervention group (n=48)	t	P
Labor time (min)				
First stage	562.04±118.75	467.78±100.16	4.204	<0.001
Second stage	84.16±24.15	42.94±10.35	10.869	<0.001
Third stage	12.65±3.01	8.62±2.18	7.513	<0.001
Total labor time	658.64±137.45	517.42±119.92	5.364	<0.001
LAS score	135.75±19.24	148.85±23.39	2.997	0.003

Note: LAS: Labor Agentry Scale.

(2) Psychological state. Self-Rating Anxiety Scale (SAS) and Self-Rating Depression Scale (SDS) were used to evaluate the degree of anxiety and depression at 5 min and 60 min after analgesia. The cut-off values of SAS and SDS were 50 and 53 respectively. Higher scores indicated serious anxiety and depression [15].

(3) Analgesic effect. According to the WHO standards, the analgesic effect was evaluated [16]. Grade 0: pregnant women felt painless and quiet. Grade 1: with midwifery, pregnant women felt slight pain but could endure it. Grade 2: pregnant women had difficulty to cooperate with the midwife, accompanied with nervousness and groaning, and moderate pain. Grade 3: pregnant women felt unwilling to cooperate with midwifery and had severe and unbearable pain, accompanied with roaring.

(4) Early pelvic floor function. On the 42nd day after delivery, the pelvic floor function was evaluated by muscle stimulation therapeutic instrument (model: PHENIX, manufacturer: VIVALNS company, France). Vaginal pressure, muscle fatigue and pelvic floor muscle strength were mainly measured. The incidences of pelvic organ prolapse (POP; the abnormal position and function of organs induced by the decline of pelvic organs caused by weak pelvic floor muscles and fascia tissues), pelvic floor dysfunction and stress urinary incontinence (SUI; no leakage of urine under normal state, but a sudden increase of abdominal pressure, such as sneezing, coughing and laughing, can result in the spontaneous outflow of urine) were measured [17].

Statistical methods

SPSS 22.0 software was used in this study. Measurement data accorded with normal distribution were expressed as mean ± standard deviation ($\bar{x}$ ± sd). Independent-samples t-test and paired-samples t-test were used for group comparison and pairwise comparison respectively. Enumeration data were expressed by (n, %) and analyzed by the χ^2 test. P<0.05 was considered statistically significant.

Results

General information

There was no significant difference in age, gestational weeks, body mass index and Bromage score before activity between the intervention group and the control group (P>0.05). See **Table 1**.

Labor time and sense of birth control

The first, second and third stages of labor time and the total labor time in the intervention group were significantly shorter than those in the control group, and the LAS score in the intervention group was significantly higher than that in the control group (all P<0.01). See **Table 2**.

Blood pressure, heart rate and pain degree

There was no significant difference in diastolic blood pressure, systolic blood pressure, heart rate and VAS score between the two groups at

Table 3. Comparison of blood pressure, heart rate and pain degree between the two groups ($\bar{x}$ ± sd)

Group	Control group (n=48)	Intervention group (n=48)	t	P
Diastolic blood pressure (mmHg)				
5 min after analgesia	86.37±4.11	85.59±5.23	0.812	0.419
60 min after analgesia	80.01±3.99***	75.57±3.24***	5.985	<0.001
Systolic blood pressure (mmHg)				
5 min after analgesia	115.58±8.11	116.62±9.74	0.568	0.571
60 min after analgesia	109.37±7.74***	104.04±7.32***	3.466	0.001
Heart rate (beats/min)				
5 min after analgesia	89.62±4.67	88.45±5.27	1.151	0.253
60 min after analgesia	81.26±3.39**	76.52±3.54***	6.700	<0.001
VAS score				
5 min after analgesia	5.23±1.57	5.44±1.46	0.679	0.499
60 min after analgesia	1.42±0.55***	0.98±0.43***	4.366	<0.001

Note: Compared with the same group at 5 min after analgesia, **P<0.01, ***P<0.001. VAS: Visual Analogue Scale.

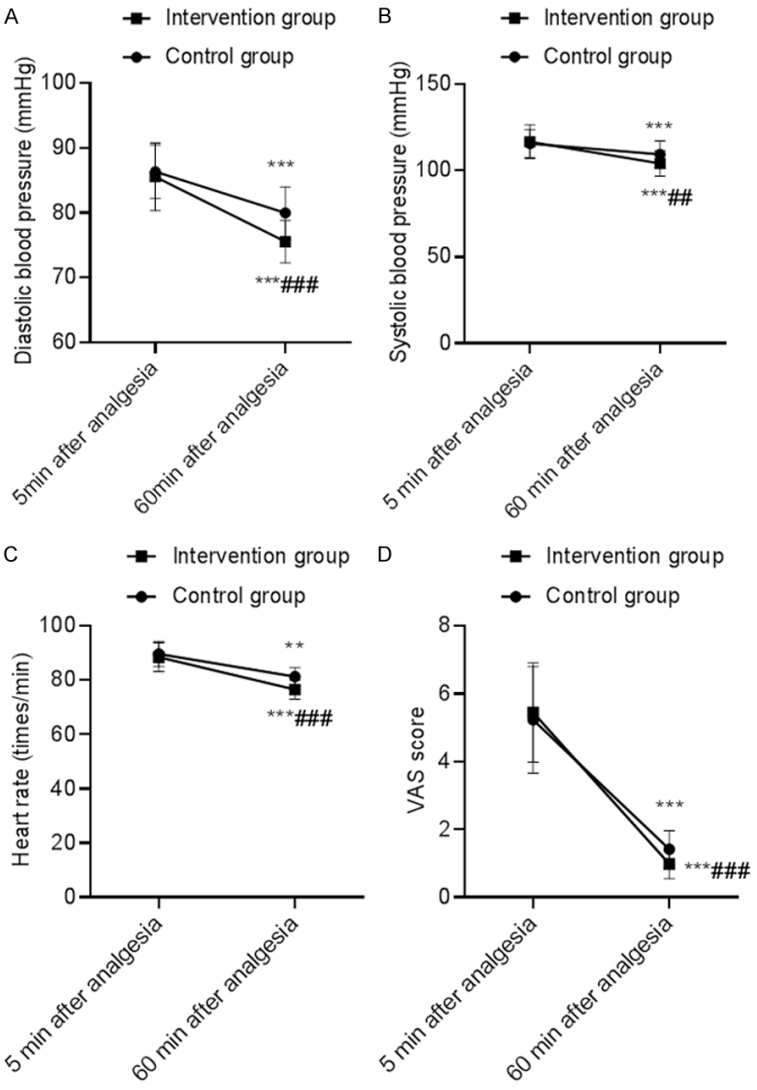

Figure 1. Comparison of blood pressure, heart rate and pain degree between the two groups. A. Diastolic blood pressure; B. Diastolic blood pressure; C. Heart rate; D. VAS score. Compared with the same group at 5 min after analgesia, **P<0.01, ***P<0.001; compared with the control group, ##P<0.01, ###P<0.001. VAS: Visual Analogue Scale.

5 min after analgesia (P> 0.05). The diastolic blood pressure, systolic blood pressure, heart rate and VAS score at 60 min after analgesia in the two groups were significantly lower than those at 5 min after analgesia, and the above indexes in the intervention group at 60 min after analgesia were significantly lower than those in the control group (P<0.01). See **Table 3** and **Figure 1**.

Psychological state

There was no significant difference in SAS and SDS scores between the intervention group and the control group at 5 min after analgesia (P>0.05). The SAS and SDS scores at 60 min after analgesia in the two groups were significantly lower than those at 5 min after analgesia, and the above indexes in the intervention group were significantly

Table 4. Comparison of psychological state between the two groups ($\bar{x}$ ± sd, score)

Group	SAS		SDS	
	5 min after analgesia	60 min after analgesia	5 min after analgesia	60 min after analgesia
Control group (n=48)	54.26±5.78	47.26±4.02***	53.16±6.37	40.67±5.51***
Intervention group (n=48)	55.39±5.11	36.39±3.38***	54.29±7.22	37.68±4.19***
t	1.015	14.339	0.813	2.993
P	0.313	<0.001	0.418	0.004

Note: Compared with the same group at 5 min after analgesia, ***P<0.001. SAS: Self-Rating Anxiety Scale; SDS: Self-Rating Depression Scale.

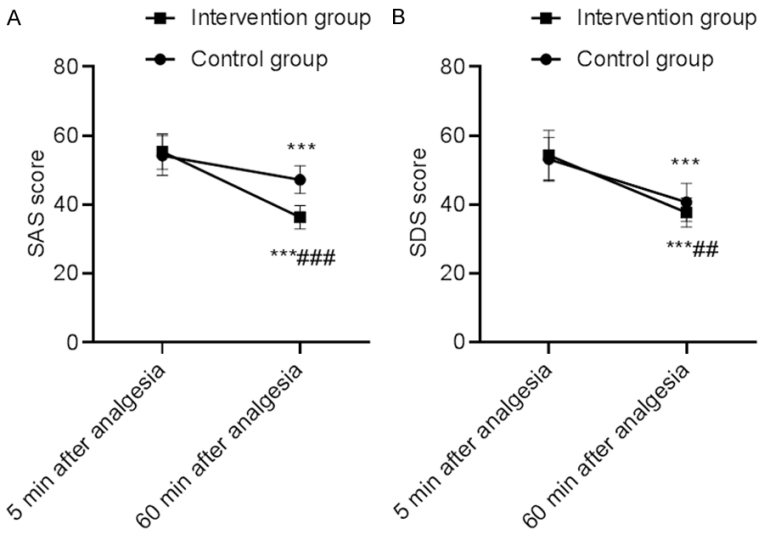

Figure 2. Comparison of psychological state between the two groups. A: SAS score; B: SDS score. Compared with the same group at 5 min after analgesia, ***P<0.001; compared with the control group, ##P<0.01, ###P<0.001. SAS: Self-Rating Anxiety Scale; SDS: Self-Rating Depression Scale.

lower than those in the control group at 60 min after analgesia (P<0.01). See **Table 4** and **Figure 2**.

Analgesic effect

The total analgesic rate of the intervention group was significantly higher than that of the control group (95.83% vs. 79.17%, P<0.05). See **Table 5**.

Delivery outcome

The total incidence of postpartum hemorrhage, perineal laceration, lateral episiotomy, fetal distress and neonatal asphyxia in the intervention group was significantly lower than that in the control group (16.67% vs. 35.42%, P<0.05). See **Table 6**.

Early pelvic floor function

There was no significant difference in the incidence of SUI 42 days after delivery between the intervention group and the control group (P>0.05). The incidences of POP and pelvic floor dysfunction in the intervention group were significantly lower than those in the control group (P<0.05). See **Table 7** and **Figure 3**.

Discussion

With the increasing rate of intraspinal labor analgesia, how to standardize the nursing management after labor analgesia has become a hot and difficult point in obstetrics research. Evidence-based nursing refers to that in the process of nursing activities, where nursing staff combine their clinical experience, research resources and patient's condition wisely, clearly and prudently to formulate a targeted nursing scheme, so as to achieve an effective response to nursing problems. Based on the evidence-based theory, this study carried out an activity management program for pregnant women receiving intraspinal analgesia. It was found that the program improved the delivery outcome and shorten labor time.

Based on the characteristics of the patients' condition, their own needs and scientific theory, the evidence-based activity management of intraspinal labor analgesia can simplify the workflow and promote the nursing work from passive to active. Through evidence-based

Table 5. Comparison of analgesic effect between the two groups (n, %)

Group	Grade 0	Grade 1	Grade 2	Grade 4	Total analgesic rate
Control group (n=48)	10 (20.83)	28 (58.33)	6 (12.50)	4 (8.33)	38 (79.17)
Intervention group (n=48)	19 (39.58)	27 (56.25)	2 (4.17)	0 (0.00)	46 (95.83)
χ^2					6.095
P					0.014

Table 6. Comparison of delivery outcome between the two groups (n, %)

Group	Control group (n=48)	Intervention group (n=48)	χ^2	P
Postpartum hemorrhage	1 (2.08)	0 (0.00)		
Perineal laceration	5 (10.42)	2 (4.17)		
Lateral episiotomy	7 (14.58)	5 (10.42)		
Fetal distress	2 (4.17)	0 (0.00)		
Neonatal asphyxia	2 (4.17)	1 (2.08)		
Total incidence	17 (35.42)	8 (16.67)	4.381	0.036

Table 7. Comparison of pelvic floor function 42 d after delivery between the two groups (n, %)

Group	POP	SUI	Pelvic floor dysfunction
Control group (n=48)	17 (35.42)	5 (10.42)	23 (47.92)
Intervention group (n=48)	7 (14.58)	1 (2.08)	12 (25.00)
χ^2	5.556	2.844	5.441
P	0.018	0.092	0.020

Note: POP: pelvic organ prolapse; SUI: stress urinary incontinence.

analysis, we can identify precautions and evidence-based problems in the nursing process, retrieve the relevant literature support in the relevant literature database, and develop a standard operation process to guide the clinical nursing work. This can facilitate nursing work to be more evidence-based and avoid nursing blindness. In this study, our results showed that the evidence-based activity management program for pregnant women after intraspinal labor analgesia effectively shortened the labor time, strengthened the analgesic effect, and relieved unhealthy emotions. The reason is that lying in bed for a long time is likely to increase the sensitivity of pregnant women to childbirth pain, accompanied by negative emotions such as fear and tension, which can increase the levels of catecholamines and adrenocorticotropic hormones in the blood, increase the cardiac load, and do harm to maternal and infant health [18]. In addition, the traditional lying position can limit the mobility of the pelvis, which makes it difficult to expand the sacrococcygeal joint, and can reduce the circulation and returned blood volume, affect the placenta circulation, and increase the resistance of the fetal head, thus weakening the labor force and prolonging the labor process. Meanwhile, the physical consumption of pregnant women is large, which can induce secondary uterine atony and increase postpartum hemorrhage [19].

However, in the evidence-based management program for pregnant women after intraspinal labor analgesia, pregnant women can choose to stand upright, sit or walk upright to delivery, which can increase pelvic volume, reduce the pressure of the uterus on the inferior vena cava, relieve the degree of uterine contraction to a certain extent, promote pelvic floor muscle relaxation and fetal head drop, and accelerate the progress of labor. When pregnant women are in the upright walking position, the uterus leaves the spine and tends to the abdominal wall. At this time, the birth axis is consistent with the longitudinal axis of the fetus. Under the action of gravity, the pressure of the fetal head on the cervix increases, which induces reflex uterine contraction, expands the cervix and shortens the labor time [20]. In the process of walking, slight joint movement can promote the fetus to rotate in the birth canal, effectively promote uterine contraction, increase the comfort of pregnant women and relieve tension and anxiety. Sitting on the delivery ball, the physical sensation of pregnant women is reflected to the projection area of neurons, which can reduce the pain sensitivity of pregnant women and help their

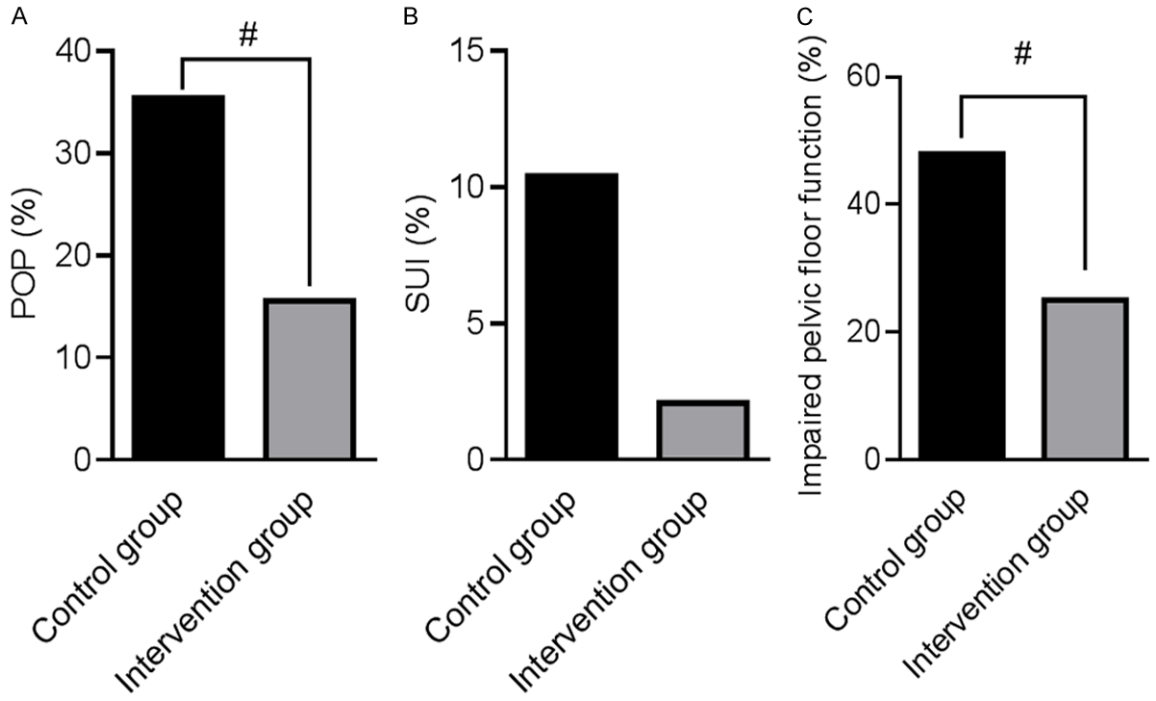

Figure 3. Comparison of pelvic floor function 42 d after delivery between the two groups. A: POP; B: SUI; C: Pelvic floor dysfunction. Compared with the control group, #P<0.05. POP: pelvic organ prolapse; SUI: stress urinary incontinence.

attention, so as to realize a painless delivery in spiritual and physical aspects. The squatting position is in line with the usual defecation habits. It can increase the diameter between the sciatic spines, expand the pelvis, relax the pelvic floor muscles, and expand the levator ani muscle to both sides and the lower part, which is beneficial to the descent of the fetal head and shorten the labor process [21, 22].

Green et al. divided the sense of self-control of childbirth into three aspects: feeling in control during contractions, feeling in control of behavior and feeling in control of what the staff was doing [23]. Good self-control of childbirth can increase the pain threshold and tolerance and improve self-confidence and self-control ability of childbirth. We found that the LAS score of the intervention group was higher than that of the control group, indicating that the activity management scheme based on evidence-based theory after intraspinal labor analgesia can improve the sense of birth control and promote the labor process. There was no significant difference in the incidence of SUI 42 days after delivery between the intervention group and the control group. The reason may be related to the small size of samples included in this study and the difference could not be shown. Therefore, it is necessary to increase the sample size for further analysis.

Our study also found that the total incidence of postpartum hemorrhage, perineal laceration, lateral episiotomy, fetal distress and neonatal asphyxia, and the incidence of POP and pelvic floor dysfunction 42 d after delivery in the intervention group were lower than those in the control group. It can be seen that the activity management program can improve the delivery outcome, reduce perinatal maternal and infant complications, and restore early pelvic floor function. The possible reason is that sitting position, upright position and semi-recumbent position can avoid uterine compression of inferior vena cava, abdominal aorta and pelvic vessels, relieve uterine placenta fetal perfusion, and thus reduce the incidence of neonatal asphyxia, intrauterine distress and other maternal and infant complications. Meanwhile, appropriate activities can promote an attention shift of the pregnant women, reduce the pain, avoid abnormal fetal heart rate and reduce the dosage of anesthetics and oxytocin during

delivery, which is beneficial to delivery [24, 25]. Free movement of lower limbs and selection of sitting position or upright position can reduce the nursing burden during the labor process and reduce the probability of catheter placement. Besides, activities during labor can help pregnant women constantly adjust their forced posture, give full play to their subjective initiative and improve their sense of birth control and self-confidence. During the activities, the explosive force of abdominal muscles, limb muscles and pelvic floor muscles of pregnant women is stronger, which can promote labor, reduce the incidence of perineal laceration and lateral episiotomy and prevent postpartum pelvic floor dysfunction [26].

However, it should be noted that accidental falls during activities in the labor process will not only affect the labor process but also can cause medical disputes. So, it is necessary to ensure that there are no movement obstacles, that pregnant women must be accompanied by family members or midwives, and that the activity area is not beyond the delivery room. At present, the research on the evidence-based activity management program for intraspinal labor analgesia is still in the initial stage, and there is not much literature to support the arguments of this research. Moreover, this study is limited to a small sample size, and the postpartum follow-up time is short. Therefore, it is necessary to further carry out multi-center, larger sample sizes, and more prospective research in later stages.

In conclusion, the evidence-based management program for pregnant women after intraspinal labor analgesia can effectively shorten the labor process, improve the analgesic effect, reduce the physiological and psychological stress reaction, improve the sense of delivery control and improve the delivery outcome and early pelvic floor function.

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Disclosure of conflict of interest

None.

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