A Comparative Study of Apgar Score and Neonatal Dysrhythmia in Painless Delivery and Natural Childbirth

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Received: 06 Jan. 2025; Accepted: 14 Oct. 2025

Abstract- Effective pain relief supports both the mother and fetus against many stressors associated with labor pain, which can have adverse effects on both. This study was conducted to determine Apgar scores and neonatal dysrhythmia in painless delivery compared with natural childbirth. The current study was conducted as a cross-sectional investigation of 213 hospital records of pregnant women (2020-2022) who underwent natural childbirth and painless delivery using a combination of two drugs: 25 µg of fentanyl and 25 mg of pethidine. Data were extracted from both groups using a checklist that included maternal age, infant sex, gravidity, parity, gestational age, birth weight, duration of labor, number of previous cesarean sections, mode of delivery, neonatal Apgar score, and dysrhythmia. In this study, 49.3% delivered painlessly, whereas 50.7% experienced natural childbirth. The mean Apgar score for infants born to mothers who underwent natural childbirth was 9.81±0.53, whereas that for infants born to mothers who experienced painless delivery was 9.93±0.53. Despite the higher Apgar scores in infants delivered using painless methods, this increase was not statistically significant. No cases of dysrhythmia were observed in either group. Based on the results of the present study, it can be concluded that there were no significant differences in neonatal outcomes, specifically Apgar scores and dysrhythmia, between the two groups. Therefore, it can be stated that painless delivery may be the preferred method of childbirth for pregnant women who have a fear of labor pain.

Acta Med Iran 2025;63(November-December):365-370.
https://doi.org/10.18502/acta.v63i6.20679

Keywords: Painless delivery; Natural childbirth; Dysrhythmia; Apgar score

Introduction

One of the most beautiful and astonishing phenomena in the world is the birth of newborns. Serious and rapid physiological changes accompany the transition from the fetal phase to life outside the womb. Therefore, immediate initial assessment of newborns is essential (1).

One of the concerns within the healthcare system is the use of medications to alleviate pain during childbirth and their potential side effects. Pain serves as an essential natural warning signal, helping identify and prevent harm to the body. The most intense pain experienced by a woman during her lifetime is during labor, which often increases their inclination toward cesarean delivery (2). Labor pain has been compared between amputation and myocardial infarction (3). Labor pain itself has direct and indirect effects on both the mother and fetus. Appropriate pain relief can mitigate many of these responses (4). Severe untreated pain may lead to postpartum depression and, in rare cases, post-traumatic stress (5-7). Studies

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indicate that fear of labor pain, as well as the perception of less pain associated with cesarean delivery, are primary reasons for pregnant women opting out of vaginal birth (8). The fear of natural childbirth has led to a significant increase in cesarean deliveries among women in our society, which carries risks related to surgery and anesthesia. Consequently, there has been a particular emphasis on painless delivery to reduce cesarean rates (9).

The health of pregnant mothers is a priority in healthcare worldwide. Physiological childbirth is associated with fewer complications than cesarean surgery and is more cost-effective from a health economics perspective (10). Effective pain relief supports both the mother and fetus against many stressors associated with labor pain, which can have adverse effects on both. These effects include hyperventilation, increased oxygen consumption, elevated cardiac output, and heightened adrenergic responses, which can reduce uterine blood flow by up to 50% (11). There are various methods of pain relief, including non-pharmacological approaches, systemic medications such as opioids and nitrous oxide, and neuraxial techniques (12). Different techniques with various drug combinations have been introduced for labor pain relief, among which regional analgesia is recognized as the gold standard. Spinal anesthesia alleviates labor pain with immediate effects (4). Vakilian *et al*., indicated that oxidative stress indicators during painless delivery did not differ from those during natural childbirth (13).

In recent years, epidural anesthesia and a combination of epidural and spinal anesthesia have become standard and widely used techniques for reducing labor pain (13). Other techniques, such as opioids, inhalational agents, and even regional blocks, may pose risks to newborns and rarely lead to complete anesthesia. The two common drugs used for epidural anesthesia are lidocaine and bupivacaine (14). One of the most important factors influencing the choice between natural childbirth and painless delivery is the health and safety of newborns. The Apgar score is the most common metric for assessing newborn health (15). The Apgar score provides a rapid assessment of the newborn immediately after birth, used to guide resuscitation efforts. The components of the Apgar score include color, heart rate, reflexes, muscle tone, and respiration. The Apgar score assesses signs of hemodynamic compromise, including cyanosis, reduced perfusion, bradycardia, hypotonia, respiratory depression, or apnea (16).

Infants born to mothers who undergo cesarean delivery are at a higher risk of low Apgar scores or perinatal mortality (17). Electrocardiography (ECG) is the primary diagnostic tool used after birth to record the electrical activity of a newborn's heart. A normal ECG requires a sinus P-wave with a P-wave axis between 0 and +90 a positive P-wave in lead II occurs before each QRS complex within a regular and normal PR interval. The heart rhythm of newborns is typically regular and falls within the normal age range (18). A review of the literature on natural and painless childbirth has revealed varying results, mainly due to the diversity of medications used in painless deliveries.

For instance, the findings of Chaurasia *et al*., regarding epidural anesthesia in painless childbirth, indicated that epidural analgesia is an effective method for painless delivery, with no significant side effects for either the mother or the newborn (1). Similarly, a study by Mohammad Forouzesh Fard *et al*., demonstrated that in painless deliveries using spinal anesthesia with pethidine and epidural anesthesia with bupivacaine, the effects on Apgar scores were normal and comparable (19), In contrast, research conducted by Golalizadeh *et al*., on the impact of combined epidural-spinal anesthesia on delivery outcomes reported maternal and neonatal complications, including headaches, prolonged third stage of labor, and lower Apgar scores in infants (9).

In this study, a combination of 25 µg fentanyl and 25 mg pethidine was used for maternal analgesia under the Ministry of Health protocols for painless delivery. Some studies have reported no differences in Apgar scores or dysrhythmias between natural childbirth, painless delivery, and cesarean section, whereas others have noted discrepancies. Given that one of the primary reasons for choosing cesarean delivery among pregnant women is the fear of labor pain, painless delivery could serve as a suitable alternative to either natural childbirth or cesarean section, provided that it is safe for the newborn. The researchers in this study decided to review maternal records and compare Apgar scores and dysrhythmias in painless versus natural childbirth over the past 2 years at Mobini Hospital in Sabzevar. This study aimed to provide insights to assist obstetricians, pain specialists, and mothers in making informed decisions about their preferences for each delivery method.

Materials and Methods

After the study protocol was approved and ethical clearance was obtained, the names and records of pregnant mothers who delivered painlessly from 2020 to 2022 were extracted from the hospital archives. Simultaneously, mothers who underwent natural

childbirth during this period were considered the natural delivery group, provided that their other characteristics were homogeneous. Sampling was conducted using a census approach, including all mothers who had experienced a painless delivery in the past 2 years and met the study's inclusion criteria. Using a researcher-designed checklist, data on maternal age, infant sex, gravidity, parity, gestational age, birth weight, duration of labor, number of previous cesarean sections, mode of delivery, Apgar scores, and dysrhythmia were collected for both groups. Neonatal dysrhythmias were assessed using electrocardiography.

All painless delivery cases over the past two years were selected according to the established inclusion criteria. The sample size for painless deliveries was determined using a census approach consistent with the research population. The exclusion criteria were incomplete medical records and heterogeneity in maternal characteristics between the painless and natural delivery groups. The study was conducted at Mobini Hospital in Sabzevar. Data from the study population were statistically analyzed using SPSS version 24. Descriptive statistics mean, standard deviation, and relative frequencies were used to determine Apgar scores and dysrhythmia rates, with 95% confidence intervals calculated for percentages. Independent t-tests were used to analyze the relationships between the dependent and independent variables.

Results

In this study, the hospital records of 213 pregnant mothers who underwent either natural childbirth or painless delivery between 2020 and 2022 were analyzed. Among the newborns, 102 (47.9%) were male and 111 (52.1%) were female. The distribution of gravidity was as follows: 97 mothers (45.5%) had their first pregnancy, 61 (28.6%) had their second, 39 (18.3%) had their third, 13 (6.1%) had their fourth, and 3 (1.4%) had their fifth. Regarding parity, there were 104 first-time deliveries, 68 second-time deliveries, 31 third-time deliveries, 9 fourth-time deliveries, and 1 fifth-time delivery. Of the participants, 105 (49.3%) had painless deliveries and 108 (50.7%) had natural childbirth. Notably, 207 mothers (97.2%) had no history of cesarean section, while only six mothers (2.8%) had a history of one prior cesarean delivery. The continuous quantitative variables are presented in Table 1.

Tables 2 and 3 also compare the mean Apgar scores and the incidence of dysrhythmia between the two natural and painless delivery groups.

No dysrhythmia was observed among 213 infants in the natural and painless delivery groups. Furthermore, the two groups had no significant difference in Apgar scores (P=0.07).

Table 1. Study variables

Quantitative variables	MinMean	Ma Max x	MeaMinn	SD
Mother's age (years)	26.84	44	15	5.82
Baby's weight (grams)	3117.16	4400	980	450.07
Gestational age (weeks)	37.5	41	35	19.35
Duration of labor (minutes)	3.53	23	0.1	5.26
Apgar score	9.87	10	7	0.46

Table 2. Comparison of the mean APGAR score in natural and painless births

Apgar score	Type of Delivery	Mean	SD	*P*
	Painless delivery	9.81	0.53	0.07
	Natural childbirth	9.93	0.39	

Table 3. Comparison of dysrhythmia and Apgar in two groups

Type of delivery			Number	Average apgar score	SD
Painless delivery	Dysrhythmia	Yes	0	-	
		No	105	9.81	0.53
Natural Childbirth	Dysrhythmia	Yes	0	-	
		No	108	9.93	0.39

Discussion

In this study, the hospital records of 213 pregnant mothers who underwent either natural childbirth or painless delivery using a combination of 25 µg fentanyl and 25 mg pethidine between the beginning of 2020 and 2022 were compared in terms of Apgar score and neonatal dysrhythmia. No cases of dysrhythmia were observed among the 213 infants in the two groups. Chourasia *et al*., conducted a study titled "Epidural Anesthesia for Painless Delivery and Its Effects on Newborns," in which 50 patients received 15 cc of 1.25% ropivacaine for epidural anesthesia, while another 50 patients, selected as the control group, did not receive any anesthesia.

The results indicated that epidural analgesia is an effective method for painless delivery with no significant side effects for either the mother or newborn (1). Naimati Honar *et al*., conducted a study titled "Maternal and Neonatal Complications of Nitrous Oxide in First-Time Pregnant Women," which was a randomized clinical trial involving 178 term pregnant women candidates for natural childbirth divided into intervention and control groups of 89 each. The results showed that the nitrous oxide group's average pain score during the first to fifth hours was significantly lower than that in the oxygen group (P=0.001). However, there were no significant differences between the two groups for factors such as labor deceleration, accelerated delivery, fetal meconium, Apgar scores at 1 and 5 minutes, and mode of delivery (natural or cesarean). These findings suggest that using nitrous oxide as a labor analgesic does not cause significant complications in mothers and newborns but may lead to transient side effects such as drowsiness, dry mouth, dizziness, nausea, and tongue numbness (20).

The researchers used a combination of 25 µg fentanyl and 25 mg pethidine for spinal anesthesia. The results indicated that None of the infants born through painless delivery exhibited dysrhythmia, and there was no significant difference in Apgar scores between the two groups, consistent with the findings of Chourasia and Naimati Honar. Radnia *et al*., conducted a clinical trial titled "The Impact of Epidural and Spinal Analgesia on Maternal and Neonatal Outcomes in Natural Deliveries," involving 126 pregnant women randomly assigned to painless delivery groups (spinal and epidural) at the anesthesiologist's discretion. The control group was randomly selected from individuals who met the inclusion criteria but did not wish to undergo painless delivery. The results indicated that none of the analgesic methods negatively affected maternal and neonatal outcomes (8). Shafieinia *et al*., also conducted a study titled "The Effect of Painless Delivery with Intrathecal Sufentanil on Labor Progression and Neonatal Outcomes." This observational cohort study included 1,055 pregnant women who were candidates for natural childbirth with spinal analgesia. Initially, 0.1 µg/kg of intrathecal sufentanil was administered, and maternal blood pressure, heart rate, and fetal heart rate were recorded after analgesia. During labor, the mothers were monitored for nausea, itching, motor block, apnea, urinary retention, and the likelihood of emergency cesarean section. Maternal pain scores were recorded based on the Visual Analog Scale (VAS), Apgar scores at one and five minutes, and arterial blood gas measurements from the umbilical cord. The results demonstrated that intrathecal sufentanil is safe and effective for painless delivery, resulting in normal Apgar scores and pH levels without significant side effects (4).

This study evaluated only the effects and complications of analgesic medications in newborns. The findings indicated that the mean Apgar score in this group was 9.81, which did not differ significantly from that of the natural childbirth group (P=0.07), and there were no instances of dysrhythmia among the newborns. These results are consistent with those of Radnia and Shafieinia, indicating that analgesic methods do not negatively affect neonatal outcomes.

Zimmer *et al*., conducted a study titled "Side Effects of Epidural Analgesia in Labor," which included data from 847 singleton pregnancies (384 primiparous and 463 multiparous). Stepwise logistic regression analysis revealed that epidural analgesia independently affected the rates of non-spontaneous and prolonged second-stage labor in primiparous women (P=0.0001). Therefore, when choosing epidural analgesia during labor, it is essential to inform women that prolonged labor duration and an increased likelihood of non-spontaneous deliveries should be anticipated (3). Mohammad Forouzesh Fard *et al*., also demonstrated that painless delivery with spinal anesthesia using pethidine and epidural anesthesia with bupivacaine had similar effects on newborn Apgar scores (19). Golalizadeh *et al*., studied the impact of combined epidural-spinal anesthesia on delivery outcomes; they reported maternal-neonatal complications such as headaches, prolonged third-stage labor, and lower Apgar scores among newborns (9).

Study of Hajipour A *et al* suggested that epidural analgesia does not significantly impact Apgar scores, NICU admissions, or emergency cesarean rates (21).

Opting for painless delivery instead of cesarean section in mothers experiencing severe fear of natural labor pain can alleviate labor pain while preventing potential disruptions to maternal mental health, avoiding mother-infant bonding issues, reducing postpartum depression risk, improving pregnancy outcomes, achieving higher Apgar scores, eliminating dysrhythmias in newborns, and ultimately ensuring better safety for both the mother and infant.

Based on the results of the present study involving two groups of pregnant mothers who underwent natural childbirth and those who experienced painless delivery using a combination of fentanyl and pethidine, it can be concluded that there were no significant differences in neonatal outcomes, specifically Apgar scores, between the two groups. Additionally, no dysrhythmia was observed in either group's infants. Therefore, it can be suggested that painless delivery may serve as a preferred method of childbirth for pregnant women.

Limitations

Include the potential for incomplete medical records and lack of homogeneity with the natural delivery group. Furthermore, future studies should involve a larger statistical sample and investigate maternal complications associated with painless delivery. To compensate for this limitation, the impact of confounding factors on painless, natural childbirth was identified through homogenization, elimination of specific factors, and determination of the effects of confounding variables using statistical tests such as logistic regression.

Acknowledgements

The authors thank all the staff at Mobini Hospital and the IT system staff who contributed to this research.

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