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Comparing Maternal and Neonatal Side Effects of Natural Vaginal Delivery under Neuro-Axial Analgesia with Usual Vaginal Delivery and Cesarean Section: A Primary Single Center Study

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Abstract

Objectives: This study aimed to compare maternal and neonatal side effects of natural vaginal delivery (NVD) under neuro-axial analgesia with usual NVD and C-section.
Methods: In this single center prospective cohort study, deliveries carried out in a 7 months' period were evaluated after getting informed consent. The study is approved by the ethics committee of Shahid Beheshti University of Medical Sciences. Mothers were categorized into 3 groups of C-section, NVD with an analgesia, intervention, and usual NVD. Afterwards, maternal and neonatal side effects after delivery were assessed using physical examinations, laboratory results, and interviews.
Results: Overall, 121 mothers were equally assigned to 3 groups. No significant differences were found in the first and fifth-minute APGAR scores of the neonates born in these 3 groups. Moreover, none of the neonates' fifth-minute APGAR scores were less than 7. In addition, hypoxia (umbilical artery pH < 7.2) was observed more in the neonates delivered by NVDs with analgesia interventions compared to the other 2 groups. In comparison with the mothers in the other 2 groups, headache and pruritus were more prevalent among the mothers who had NVDs under neuro-axial analgesia.
Conclusions: Given the advantages of natural vaginal deliveries for mothers and their fetuses and considering the side effects of C-sections without medical indications, propagating painless NVDs could be a proper solution for increasing the prevalence rate of NVDs in the society. Conducting further studies on larger samples is recommended.

Keywords: Natural Vaginal Delivery, Cesarean Section, Neuro-Axial Analgesia, Outcomes, APGAR Score

1. Background

Delivery is one of the most painful events that can occur for any mother (1). Delivery methods are classified into 2 broad categories, i.e. natural vaginal delivery (NVD) and C-section (2). In 2002, the C-section rate in Iran was 37% (3); however, in 2004, this rate had reached 39.2% (4). Considering the C-section rate, Iran was ranked second in the world (5). Side effects of C-sections are much more than NVDs. The maternal mortality rate for C-sections was reported to be 2 to 3 times more than NVDs (5). Moreover, the risk of neonatal death after C-sections is 4 times more than that after NVDs. In addition, APGAR scores of neonates delivered by C-sections were reported to be less than those of neonates delivered naturally (6) and tachypnea of the newborn can be seen more after C-sections (7). In general, it is believed that a natural vaginal delivery prepares a newborn baby to live outside the uterus and it particularly improves his/her breathing (8).

As mentioned earlier, given the advantages of NVDs compared to C-sections, propagating natural deliveries is of significant importance. Propagating NVDs with analgesia interventions can be considered as a way to increase interest in having natural deliveries (1). Among analgesia methods, epidural analgesia, spinal analgesia, a combination of epidural and spinal analgesia (spinal or neuro-axial anesthesia), as well as inhaled drugs can be mentioned (9). Although relieving pain is one of the most important advantages of spinal analgesia (9), several side effects, such as slowing down the progress of natural childbirth, were also reported in this type of analgesia. Furthermore, other side effects including a prolonged postpartum convalescent period after delivery, headache, backache, low APGAR scores in neonates, and some respiratory problems were reported after performing spinal analgesia (10). This is while other studies mentioned that applying spinal analgesia in NVDs was not accompanied with any serious side effects. The main reason for this disagreement could be the difference in the method of applying this type of analgesia and the fact that the considered subjects did not have similar con-

ditions.

Overall, according to what was noted above, the main objective of this study, as a primary single center study, was to compare a maternal and neonatal outcome of natural vaginal delivery conducted with an analgesia intervention (spinal or neuro-axial analgesia) with usual natural vaginal delivery and cesarean section. Through carrying out this study, horizons of natural deliveries performed with analgesia interventions appear in a better way.

2. Methods

The present study was approved by the research ethics committee of Shahid Beheshti University of Medical Sciences.

Study population: In this prospective cohort study, a number of pregnant women with term pregnancies who underwent deliveries in Ayatollah Taleghani hospital in Tehran in a 7-month period (from September 22, 2014 to March 20, 2015) were enrolled. Informed consent was taken from all enrolled cases.

Generally, the inclusion criteria of the present study were the maternal age of 20 to 38 years old, term pregnancy (37 - 40 weeks), and informed consent for entering the study. The exclusion criteria of the current study included suffering from chronic diseases, suffering from pregnancy diseases (such as gestational diabetes, preeclampsia, and eclampsia), requiring an emergency delivery, cervical dilatation of less than 4 cm, probable estimated disproportion of cephalopelvic, malpresentation of fetus, hypovolemia, coagulopathy, neurological disorders, history of allergy to anesthetics, fetal anomalies, or unwilling of mothers for participating in the study. Moreover, the exit criteria of this study included the occurrence of any unforeseen event in the process of NVD or C-section, which needs emergency procedures and the need for performing C-sections on mothers who underwent NVDs.

The method of selecting and assigning these mothers to each group was in a way that initially mothers who, according to their obstetricians' opinions, were candidates for cesarean sections were assigned to C-section group. Afterwards, mothers who were candidates for NVDs were consulted (by an anesthesiologist, an obstetrician, and a midwife) to have NVDs with analgesia interventions and those who were eager to have such deliveries were assigned to NVD with an analgesia intervention group (this is a usual procedure in the center where the study is conducted). Finally, mothers who had usual NVDs were placed in the usual NVD group. The number of mothers assigned to each group was determined based on the number of mothers entered into the NVD with an analgesia intervention group during the sample collection period (7 months). The selection of mothers with a C-section and usual NVD among all performed deliveries during the study time period were randomly accomplished based on the general inclusion criteria. As a result, the enrolled mothers were divided into 3 groups: Group 1, the mothers who underwent NVDs without any analgesia interventions. Group 2, the mothers who had NVDs under neuro-axial analgesia with their full consent, and group 3, the mothers who underwent C-sections.

Data collection: After obtaining informed consent from the mothers, some information including the mothers' age, number of pregnancies, level of education, and type of analgesia intervention conducted was gathered. To examine and compare maternal and neonatal side effects in all 3 groups, maternal side effects and complaints including headache, backache, shortness of breath, urinary retention, nausea, pruritus, a sense of imbalance, and dizziness were collected a day after deliveries through interviewing the mothers and filling out a questionnaire. Twin pregnancies and mothers who suffered from these side effects during or before pregnancy were excluded.

A day after performing the deliveries, through conducting interviews and filling out the questionnaire, the mothers' opinions about having NVD with an analgesia intervention, their satisfaction with and ability to do NVD with an analgesia intervention, and the severity of pain they perceived during NVD were questioned. Data related to the mothers' doubts on having NVD with an analgesia intervention, their satisfaction with consultations provided before giving birth with an analgesia intervention, their satisfaction with the method of performing NVD with an analgesia intervention by their doctors, their ability to move and push during NVD after analgesia, their ability to breastfeed their neonates immediately after having NVD with an analgesia intervention, and the severity of pain they perceived after analgesia was collected (on a scale ranging from 0 to 10).

Neonatal side effects were measured by APGAR scores in the first and fifth-minute and the possibility of fetal hypoxia during delivery (determined by an umbilical cord blood gas analysis carried out immediately after birth based on which any neonate with an ABG (Arterial Blood Gas) pH<7.2 is considered to suffer from hypoxia) was assessed.

Statistical analysis: To describe the obtained data, the frequency, percent, median, range, mean, and standard deviation were used. Moreover, the chi-square test was applied to examine significant differences among two-state groups. The analysis of ordinal variables between groups has done by using Kruskal-Wallis with Mann-Whitney post-hoc. Continuous variables between groups have been analyzed using one-way analysis of variance (ANOVA) with

post- hoc-Tukey's. All statistical analyses were carried out via SPSS software, version 20 (SPSS Inc., Chicago, IL, USA).

3. Results

Examining the number of deliveries performed in Ayatollah Taleghani hospital from September 22, 2014 to March 20, 2015 demonstrated that out of 284 NVDs conducted in this period of time, only 41 (14.4%) NVDs with analgesia interventions were performed. However, the total number of deliveries (NVDs and C-sections) conducted in this period of time was 586 (Table 1).

A total of 121 pregnant women referred for giving birth were entered into the study. All enrolled cases accomplished the study and no one was exited during the study according to the exit criteria. Among these women, 40 mothers underwent usual NVDs (group 1), 41 mothers had NVDs with analgesia interventions (spinal block, epidural block, or a combination of epidural and spinal block) (group 2), and 40 mothers underwent C-sections (group 3). The mean ages of mothers placed in these groups were respectively 26.93 ± 5.23, 25.34 ± 4.96, and 29.74 ± 4.92. This indicated that the mean age of mothers placed in the C-section group was higher than that of the other 2 groups ($P = 0.006$). Moreover, the mean number of pregnancies among the mothers placed in the C-section group was greater than that of the other groups ($P = 0.0045$). Among samples collected from the mothers in the NVD with an analgesia intervention (group 2), 12 mothers (29.3%) underwent epidural analgesia, 27 mothers (65.9%) underwent spinal analgesia, and 2 mothers (4.9%) underwent a combination of these 2 blocks. Furthermore, analgesia was carried out on the mothers who underwent C-sections using spinal (27 mothers, 67.5%) and general anesthesia (13 mothers, 10.7%) methods (Table 2).

A day after performing deliveries, all the mothers' complaints were evaluated using the questionnaire (Table 3). This questionnaire included complaints of headache, backache, shortness of breath, urinary retention, nausea, pruritus, a sense of imbalance, and dizziness. 5% (2 mothers) of the mothers in the first group, 22% (9 mothers) of the mothers in the second group, and 5% (2 mothers) of the mothers in the third group complained of headaches after their deliveries ($P < 0.05$). In addition, 6 mothers (14.6%) who underwent NVDs (group 2) complained of pruritus; however, none of the mothers in the other 2 groups complained of pruritus ($P < 0.05$). With regard to the other side effects studied in this study such as backache, shortness of breath, urinary retention, nausea, a sense of imbalance, and dizziness, no significant differences were found among the groups. These side effects had a little incidence among the cases.

Additionally, fetal health status was evaluated immediately after delivery using the first and fifth-minute APGAR scores and the possibility of prenatal hypoxia (determined by umbilical cord artery gases analysis at birth) was assessed. No significant differences were found among the first and fifth-minute APGAR scores of the neonates born in these 3 groups. It should be noted that none of the neonates' fifth-minute APGAR scores were lower than 7. The results of examining the risk of prenatal hypoxia indicated that prenatal hypoxia was observed more among the neonates delivered under analgesia interventions (group 2) compared to the other 2 groups. According to the umbilical arterial blood gases analyses, 9 neonates (22%) born in the second group suffered from prenatal hypoxia. This is while 3 neonates (7.5%) delivered naturally in the first group and 1 neonate (2.5%) delivered by a C-section in the third group suffered from prenatal hypoxia (Table 3).

As presented in Table 4 and this, 7 mothers (17.1%) who underwent NVDs with analgesia interventions had doubts about doing this type of delivery; however, 1 mother (2.4%) was not satisfied with the consultations provided before carrying out this type of delivery and the method of performing analgesia by her doctor. 38 mothers (92.7%) were able to move and 39 mothers (95.1%) were able to push after performing analgesia. All 41 mothers who underwent NVDs with analgesia interventions were able to breastfeed their neonates immediately after giving birth. Evaluating the severity of pain these mothers perceived after performing analgesia, the results showed that while 25 mothers (61%) did not feel any pain, 7 mothers (17.07%) reported to feel 5 or greater levels of perceived pain (Table 5).

4. Discussion

The main objective of this study was to compare maternal and neonatal outcome of usual natural vaginal delivery, natural vaginal delivery with an analgesia intervention, and C-section. In addition, the mothers' satisfaction before and after performing NVDs with analgesia interventions and the severity of pain they perceived was evaluated. The preliminary evaluations showed that the rate of NVD with an analgesia intervention was 0.14 times of all NVDs. The high prevalence of C-sections in this center indicated a low incidence rate of this type of delivery. According to the Health Transformation Plan, propagating NVDs is of the utmost importance, such that in order to encourage mothers to have NVDs, this type of delivery is conducted for free. However, given their fear of delivery pain, mothers are not willing to have this type of delivery and they tend to have C-sections. In particular, with regards to NVD with an analgesia intervention, previously carried out studies indicated that most of mothers were worried about its side effects

Table 1. The Prevalence of Various Types of Delivery in Ayatollah Taleghani Hospital in Tehran from September 22, 2014 to March 20, 2015

Variables	Sep 22, 2014	Oct 22, 2014	Nov 21, 2014	Dec 21, 2014	Jan 20, 2015	Feb 19, 2015	Mar 20, 2015	Total
NVD with an analgesia intervention, No.	1	4	9	11	7	6	3	41
Total NVDs, No.	30	23	33	46	50	47	55	284
Ratio of NVDs with analgesia interventions to usual NVDs, %	3.33	17.39	27.2	23.9	14	12.76	4.45	14.4
Total NVDs and C-sections, No.	75	66	63	104	104	80	94	586

Table 2. The Mothers' Information Entered into the Study[a]

Varibales	NVD	NVD with an Analgesia Intervention	C-Section	P Value
Age	26.93 ± 5.23	25.34 ± 4.96	29.74 ± 4.92	0.006[b]
Number of pregnancies				0.004[c]
1	19 (47.5)	30 (73.2)	13 (32.5)	
2	19 (47.5)	10 (24.4)	20 (5)	
3	1 (2.5)	0 (0)	6 (15)	
4	0 (0)	1 (2.4)	1 (2.5)	
5	1 (2.5)	0 (0)	0 (0)	
Median (range)	2 (1 - 5)	1 (1 - 4)	2 (1 - 4)	
Level of education				0.916[c]
Illiterate (1)	2 (5)	1 (2.4)	2 (5)	
Middle school (2)	5 (15)	6 (14.6)	9 (22.5)	
High school (3)	8 (22)	10 (24.4)	9 (22.5)	
Diploma (4)	14 (35)	14 (34.1)	14 (35)	
Associate degree (5)	4 (10)	2 (4.5)	2 (5)	
BA (6)	5 (12.5)	8 (19.5)	4 (10)	
MA (7)	1 (2.5)	0 (0)	0 (0)	
Median (range)	4 (1 - 7)	4 (1 - 6)	3.5 (1 - 6)	
Type of analgesia or anesthesia				-
Epidural	-	12 (29.3)	-	
Spinal	-	27 (65.9)	27 (67.5)	
Combined	-	2 (4.9)	-	
General anesthesia	-	-	13 (32.5)	

[a] The data are presented as No. (%) or mean ± standard deviation.
[b] ANOVA.
[c] Kruskal-Wallis.

including headache and backache. Therefore, the current study aimed to qualitatively examine side effects of delivery with an analgesia intervention. In the present study, the cases were divided into 3 groups and were compared to each other. The statistical analysis indicated no significant differences among these groups with regard to the mean age, number of pregnancies, and level of education. This showed that the groups were matched.

Among neonatal outcomes examined in this study, no significant differences were found among the first and fifth-minute APGAR scores of the neonates born in 3 groups. Additionally, considering the results of ABG, the neonates delivered naturally under analgesia interventions indicated more abnormalities. Furthermore, maternal side effect of natural vaginal delivery with an analgesia intervention has been assessed here. The results indicated that in comparison with the mothers who had NVDs and C-sections, only headache and pruritus were more prevalent among the mothers who underwent NVDs with analgesia interventions. These findings are in line with the results of several previously conducted studies. For instance, a case-control study by Kumar et al., in 2014, was carried out on 206 cases that were neonates $\geq$ 34 weeks gestation who developed respiratory distress within 24 hours of life requiring supplemental oxygen $\geq$ 2 hours and/or positive pressure ventilation in the neonatal intensive care unit. 206

Table 3. The Maternal and Neonatal Side Effects Examined in this Study[a]

Variables	NVD	NVD with an Analgesia Intervention	C-Section	P Value
Neonatal side effects				
First-minute APGAR score				
6	1 (2.5)	4 (9.8)	0 (0)	
7	1 (2.5)	3 (7.3)	1 (2.5)	0.073[b]
8	4 (10)	2 (4.9)	1 (2.5)	
9	34 (85)	32 (78)	38 (95)	
Median (range)	9 (6 - 9)	9 (6 - 9)	9 (7-9)	
Fifth-minute APGAR score				
7	0 (0)	1 (2.4)	0 (0)	
8	0 (0)	3 (7.3)	0 (0)	0.141[b]
9	3 (7.5)	0 (0)	0 (0)	
10	37 (92.5)	37 (90.2)	40 (100)	
Median (range)	10 (9 - 10)	10 (7 - 10)	10 (10)	
Hypoxia (abnormal ABG)				
Yes	3 (7.5)	9 (22)	1 (2.5)	0.013[c]
No	37 (92.5)	32 (78)	39 (97.5)	
Maternal side effects				
Headache				
Yes	2 (5)	9 (22)	2 (5)	0.041[c]
No	38 (95)	32 (78)	38 (95)	
Backache				
Yes	8 (20)	8 (19.5)	9 (22.5)	0.939[c]
No	32 (80)	33 (80.5)	31 (77.5)	
Shortness of breath				
Yes	1 (2.5)	2 (4.9)	2 (5)	0.818[c]
No	39 (97.5)	39 (95.1)	38 (95)	
Urinary retention				
Yes	0 (0)	2 (4.9)	0 (0)	
No	40 (100)	39 (95.1)	40 (100)	
Nausea				
Yes	1 (2.5)	2 (4.9)	0 (0)	
No	39 (97.5)	39 (95.1)	40 (100)	
Pruritus				
Yes	0 (0)	6 (14.6)	0 (0)	
No	40 (100)	35 (65.4)	40 (100)	
A sense of imbalance				
Yes	0 (0)	1 (2.4)	0 (0)	
No	40 (100)	40 (97.6)	40 (100)	
Dizziness				
Yes	1 (2.5)	3 (7.3)	0 (0)	
No	39 (97.5)	38 (92.7)	40 (100)	

[a] The data are presented as No. (%).
[b] Kruskal-Wallis.
[c] Chi-Square.

controls were gestation and site-matched neonates who did not develop any respiratory distress within the same period. Exposure to epidural analgesia was observed in 146 cases (70.9%) as compared with 131 of the controls (63.6%). The association between exposure to epidural analgesia and respiratory distress in neonates was statistically significant upon adjustment for all potential confounders (11). Moreover, Shahshahan et al., in Iran, determined the distribution of hypotension as the most common side effect of epidural anesthesia and its effects on mothers, their fetuses, and finally born neonates. In this study, 137 pregnant women (mostly 21 to 30 years old) voluntarily under-

Table 4. The Mothers' Opinions on NVD with an Analgesia Intervention, Their Confidence in Performing This Method, and the Experiences They Gained[a]

Variables	Doubts about Having This Method	Satisfaction with Consultations Provided Before Delivery	Satisfaction with the Method of Delivery with an Analgesia Intervention	Ability to Move During Delivery	Ability to Push During Delivery	Ability to Breastfeed
Yes	7 (17.1)	40 (97.6)	40 (97.6)	38 (92.7)	39 (95.1)	41 (100)
No	34 (82.9)	1 (2.4)	1 (2.4)	3 (7.3)	2 (4.9)	0 (0)

[a]The data are presented as No. (%).

Table 5. The Severity of Pain Perceived After Performing Analgesia Interventions in Mothers Who Underwent Such Deliverie

Level of Pain	0	1	2	3	5	7	8	10
No. (%)	25 (61)	2 (4.9)	4 (9.8)	3 (7.3)	2 (4.9)	2 (4.9)	2 (4.9)	1 (2.4)

went epidural analgesia. The gestational age ranged from 37 to 42 weeks. The data analysis of all the cases showed that the distribution of hypotension was 16.1%. The neonatal APGAR score of the neonates of those mothers who had hypotension during delivery was 8 ± 1.23, while the APGAR score of the neonates of those who did not have hypotension was 9 ± 0.72. The relative frequency of dizziness was 20.4% (12). These results were in accordance with our results indicating a higher risk of hypoxia following neuroaxial analgesia for natural delivery. Therefore, extensive cares for neonates delivered under this condition is recommended.

In a study done by Rafiei et al., in 2006, the effects of epidural anesthesia with Marcaine and Fentanyl on labor course has been evaluated. Therefore, they equally assigned 100 cases into 2 groups of NVD without analgesia and NVD with analgesia. In the first 12 hours after giving birth, the severity of pain in the place of episiotomy in painless NVDs was less than the severity of pain in NVDs without analgesia and the level of pain in most of the cases was in class I. However, in NVDs without analgesia, most of the cases had pain severity in class II or III. The painless delivery method shortened the time of the first stage of labor compared to the usual NVDs. This is while the second and third stages of labor were not different from those of the usual NVDs (13). It seems that, as we also showed in this study, there are no major maternal complications after NVDs with analgesia intervention. Therefore, according to mentioned studies and our results, epidural anesthesia could be considered as a reliable and safe method for propagating vaginal delivery and reducing the prevalence rate of unnecessary cesarean sections.

Furthermore, in the present study, the mothers' ability to move, push, and breastfeed after giving birth, and their perception of pain in the process of painless childbirth were examined. Fortunately, the majority of the cases were able to move and push and all of them were able to breastfeed their neonates after giving birth. However, some studies reported several problems in breastfeeding neonates after having NVDs with analgesia interventions. As an instance, in 2013, Dozier et al. analyzed potential associations between epidural anesthesia and overall breastfeeding cessation within 30 days postpartum while adjusting for standard and novel covariates as well as uniquely accounting for labor induction. In this study, a relationship between epidural anesthesia and breastfeeding was found, however, this relationship was complex and involved institutional, clinical, maternal, and infant factors (14).

Finally, 61% of the mothers who underwent NVDs with analgesia interventions did not report any pain. Reporting pain by the other cases indicated that the analgesia interventions might not have been performed in a proper way.

In conclusion, it can be mentioned that given the advantages of having NVDs for mothers and their fetuses and since this type of delivery is accompanied with insignificant as well as controllable side effects, encouraging mothers to have NVDs with analgesia interventions can aid us to propagate NVDs. Lastly, conducting larger multi center studies aimed at examining further effects and side effects of painless childbirth is highly recommended.

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Footnote

Conflict of Interests: None.

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