



## COMPARISON OF LABOR PHASES IN PAINLESS DELIVERY WITH EPIDURAL ANALGESIA AND ENTONOX ADMINISTRATION

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### ABSTRACT

Labor pain is the most severe pain a woman may experience in her life and is usually longer and more intense than expected, especially in nulliparous women. Childbirth is the most remarkable phenomenon in a woman's life. However, parturient mothers are greatly concerned with labor pain and possible risks to their life. This study aimed to compare the duration of different labor phases in vaginal delivery after epidural or general analgesia. This study was conducted on 90 pregnant women referred to Taleghani Hospital in Arak, Iran. Participants were divided into three groups of 30, including epidural analgesia, general analgesia with Entonox gas, and control. Study groups were compared in terms of the duration of the first and second phases of labor, frequency of cesarean delivery, neonatal Apgar scores, and rate of postoperative complications (e.g., headache, nausea, vomiting, and back pain). In this study, mean age of the pregnant women was equal in all study groups, and no significant difference was observed in this regard. Mean of gestational age in the patients was 39 weeks, and the mean duration of the first labor phase was not significantly different between the study groups. Moreover, mean duration of the second labor phase was higher in the control group compared to the other patients, while it was higher in the epidural group compared to the Entonox group. According to the results of this study, painless delivery techniques, such as epidural or Entonox analgesia, do not increase the duration of the first and second phases of labor. However, use of Entonox could significantly decrease the duration of the second phase of labor.

**Keywords:** Entonox, Woman, Childbirth, Epidural Analgesia, Painless Labor.

### INTRODUCTION

Labor pain is probably the most severe pain a woman may experience in her life and it is usually longer and more intense than expected, especially in nulliparous women<sup>1</sup>. Labor pain in natural childbirth is the most excruciating pain experienced by human<sup>2</sup>. Childbirth is a consequential event, and while it is a dream of every woman, there are lingering concerns regarding labor pain and the possible risks of this process to the life of the mother<sup>3</sup>. In a joint statement with the American Society of Anesthesiologists, the American College of Obstetricians and Gynecologists (2002) declared that request for the reduction of labor pain in parturient calls

for devising new pain relief techniques. In this regard, gynecologists or licensed midwives are responsible for proper planning of pain relief procedures through consultation with an anesthesiologist if necessary. During 1970-2007 in the United States, rate of cesarean section was reported to increase from 4.5% to 35% in all deliveries; this rising trend was due to the frequency of elective cesarean as chosen by parturient women. While the risk of mortality is nine times higher in emergency cesarean compared to natural delivery, elective cesarean is associated with a three-fold increased risk of mortality. According to statistics, rate of severe complications following childbirth had a significant increase during 1998-1999 and 2004-2005 in the United

States, which was reported to be caused by the rising trend of cesarean section. Comparison of natural vaginal delivery and cesarean section has indicated that maternal morbidity is twice higher in cesarean delivery. Furthermore, rate of re-hospitalization within 30 days after delivery is twice higher in cesarean section compared to vaginal delivery (75% versus 19 per 1,000 deliveries)<sup>4</sup>. Statistics in Iran indicate that the rate of cesarean deliveries has been growing dramatically, especially in capital cities. Similar findings have been reported in different countries across the world. It is interesting that in our society, people normally refuse to undergo even small surgeries and prefer alternative medicinal treatments, while many pregnant women insist on cesarean section despite possible complications. Cesarean delivery is a sizeable surgery associated with numerous complications, which could occasionally be risky or life threatening. Painless childbirth techniques are mainly aimed at reducing the rate of cesarean section, increasing tendency towards natural vaginal delivery, offering methods to soothe distress during natural labor, and decreasing the morbidity caused by cesarean section and other complicated deliveries. Therefore, painless labor seems to be a plausible alternative for cesarean deliveries without indication in our country<sup>5</sup>. In recent years, several studies have evaluated the effect of epidural analgesia on factors such as delivery progress, duration of different phases of labor, rate of cesarean section, and use of assisting tools in the process of childbirth<sup>6,7</sup>. Some of these studies have indicated that epidural analgesia may increase the duration of different phases of labor<sup>6-8</sup>, while other researchers have suggested that duration of the active phase of labor may reduce due to epidural analgesia<sup>9</sup>. On the other hand, some studies have proposed that epidural analgesia causes no significant difference in the duration of labor in vaginal delivery and cesarean section<sup>10</sup>. Therefore, there is still controversy regarding the exact effects of epidural analgesia on the duration of different phases of labor<sup>6</sup>. In many countries, painless labor through epidural administration is recommended as the most effective method to relieve labor pain during natural childbirth<sup>11</sup>. However, this approach is not widely used in Iran due to the concerns about the side effects of epidural analgesia on the mother and infant compared to other methods (e.g., spinal or general anesthesia). As such, comparison of the duration of different labor phases could help medical experts identify the actual concerns in this regard<sup>5</sup>. This study aimed to compare the duration of different labor phases in vaginal delivery after epidural or general analgesia in order to use epidural analgesia as an efficient alternative for other painless methods of childbirth. This was achieved in case the phases of delivery were not prolonged, leading to lower complications and higher satisfaction of the patients. Unfortunately, techniques for painless labor are not commonly practiced in Markazi province in Iran. This is mostly because specialists believe that the duration of natural delivery is likely to increase by using

epidural analgesia. Moreover, there is a misconception among pregnant women suggesting that this method of pain relief leads to postoperative complications, such as back pain. It is hoped that the findings of this study will contribute to the reduction of cesarean section and encourage painless natural delivery.

## MATERIALS AND METHODS

Ethical committee of number 90-116-3. This study was conducted on 90 pregnant women referred to Taleghani Hospital in Arak, Iran. Participants were divided into three groups of 30. Inclusion criteria of the study were as follows: 1) primigravida women; 2) singleton pregnancies; 3) term pregnancy of 37-42 weeks; 4) no medical diseases and 5) cervical dilation of 3-4 cm (beginning of the active labor phase). The first group (n=30) received epidural analgesia with injection of 0.125% Marcaine (4-6 cc) and Fentanyl (5 µg) in single doses at segments of L4-L5 or S1-L5 (maximum solution volume: 10 cc). In addition, patients in this group received a maintenance dose of 6-10 cc/hr for 0.125% Marcaine, and 0.0002% Fentanyl was also injected via catheter. The second group (n=30) received general analgesia with Entonox gas. Entonox was transferred to inhalation agents through a valve, which opened only when the patient started to breathe. In this method, the patient would take a deep, slow breath before the expected labor contractions, and when the contractions began to progress, the patient would stop the breaths. In this study, the third group consisted of 30 pregnant women who were considered as control subjects receiving no medication for labor pain relief. After drug administration by an anesthesiologist, vital signs of the patients were monitored simultaneously. Moreover, fetal heart rate was controlled every 15 minutes, and the duration of each labor phase was accurately calculated in minutes. With regards to labor progress, cervical examination was performed every two hours until full dilation of the cervix. This process continued until the infant was born, and the delivery was complete. Finally, neonatal Apgar scores were recorded in prepared forms by residents of gynecology. Comparison of the study groups was performed in terms of the duration of the first and second phases of labor, frequency of cesarean delivery, neonatal Apgar scores, and prevalence of postoperative complications (e.g., headache, nausea, vomiting, and backache).

## RESULTS

In this study, mean age of the pregnant women was almost equal in all three groups (22 years), and no significant difference was observed between the patients in terms of age ( $P>0.05$ ). Mean of gestational age was estimated at 39 weeks, and no significant difference was observed between the groups in this regard ( $P>0.05$ ). In the group receiving epidural analgesia, mean duration of

the first labor phase was 154.37 minutes, while it was calculated at 143.8 and 177.5 minutes in the Entonox and control groups. A significant difference was observed between the study groups regarding the length of the first labor phase ( $P<0.01$ ). Accordingly, mean duration of the first phase of labor was significantly higher in the control group, while it was at the lowest level in the Entonox group. With respect to the second

phase of labor, the duration was estimated at 49.1 minutes in the epidural group, while it was 39.5 and 53.8 minutes in the Entonox and control groups. No significant difference was observed between the groups in this regard ( $P<0.001$ ). Moreover, mean duration of the second labor phase was at the highest level in the control group, while it was higher in the epidural group compared to the Entonox group.

**Table 1**  
*Characteristics of Patients in Different Study Groups*

	Epidural Analgesia	Entonox Administration	Control	P-value
<b>Maternal Age (year)</b>	23.21±0.11	21.13±0.94	22.11±0.21	NS*
<b>Gestational Age (week)</b>	39.21±0.73	38.92±0.32	39.31±0.97	NS
<b>Labor Phase I</b>	154.37±12.31	143.82±8.51	177.53±13.61	0.01
<b>Labor Phase II</b>	49.12±2.63	39.52±1.93	53.82±3.72	0.001
<b>Frequency of Cesarean Section</b>	2 (2.2%)	2 (2.2%)	1 (1.1%)	NS

\*NS: Not significant

## DISCUSSION

Comparison of the differences in the duration of labor phases between various techniques of painless delivery results in the proper application of these methods in order to control labor pain more efficiently. Several studies have focused on determining whether each method of painless delivery could increase the duration of active labor phases, which confirms the efficacy of these techniques in the management of labor pain. Findings of the present study were indicative of a significant difference in the duration of labor phases in various pain relief techniques. Accordingly, mean duration of labor phases was lower in the Entonox group compared to the epidural analgesia group, while it was lower in the epidural group compared to the control group. In other words, use of painless delivery methods (e.g., Entonox and epidural analgesia) was associated with no significant increase in the duration of labor phases. Moreover, these techniques were observed to improve and reduce the average length of each active phase of labor. According to the results of the current study, mean duration of the first and second phases of labor was higher in the control group compared to the Entonox and epidural analgesia groups. On the other hand, paired comparison of the Entonox and epidural analgesia groups indicated that the labor phases were significantly longer in the epidural group compared to the Entonox group. The results of the present study were consistent with the findings of similar studies in this regard. For instance, in one study, it was stated that the mean duration of active labor phases was lower in patients administered with

analgesic drugs to relieve labor pain compared to the control group. On the other hand, prolongation of labor after the use of epidural analgesia in painless delivery has been stipulated in the literature. Beyond doubt, natural childbirth is accompanied with excruciating pain, so that in McGill pain index (1990), after causalgia (neuroleptic-induced pain), labor pain has a higher score than other inflictions caused by fractures, cuts, and chronic back pain<sup>4</sup>. In painless delivery methods, it is necessary to provide a calm environment for mothers in order to encourage natural childbirth and reduce tendency towards cesarean section<sup>4,8,12</sup>. According to the results of the present study, use of epidural and inhaled analgesia had a remarkable effect on controlling delivery pain during the first and second phases of labor. It is well established that T10-L1 and S2-S4 segments are responsible for the innervations of dermatomes associated with the first and second stages of labor, respectively. Recent studies have indicated that Entonox and epidural analgesia are both effective in the management of pain during the two active phases of delivery<sup>12,13</sup>. In the current study, patient satisfaction was higher in the epidural analgesia group, and the score of labor pain was lower in this group. According to the literature, regional pain relief techniques, especially epidural analgesia, are flexible and effective with low rates of postoperative complications<sup>2,5,12</sup>. Findings of the present study indicated that epidural analgesia had a significant effect on the overall health and one-minute Apgar scores of the neonates in the control group compared to those in the Entonox and epidural analgesia groups. However, no significant difference was observed between the groups in terms of neonatal Apgar scores. Moreover, no

significant difference was observed between the study groups in terms of five-minute Apgar scores. Other results of the current study were indicative of no significant difference between the control, Entonox and epidural analgesia groups in terms of the frequency of cesarean delivery. However, the frequency of cesarean section was reported to be higher in the pregnant women who used painless delivery techniques compared to the control group. Regarding the complications associated with painless delivery methods during labor, the only side effect observed in patients of the Entonox group was nausea and vomiting, which was significantly more prevalent than the other study groups. However, no specific complications due to the use of epidural analgesia were reported in these patients. Based on the findings of previous studies and the current research, it could be concluded that use of painless delivery techniques could enhance the relaxation and satisfaction of mothers during labor, which plays a pivotal role in reducing the tendency towards cesarean section<sup>5,12</sup>.

In fact, satisfaction of parturient women during labor is a central contributing factor for reducing the rate of cesarean delivery in different communities<sup>2,12</sup>. In the current study, satisfaction of the patients in the two groups of Entonox and epidural analgesia was significantly higher than the control group. Furthermore, paired comparison of patients in the Entonox and epidural analgesia groups revealed that mothers in the epidural group were more satisfied and had lower pain scores compared to the other study groups.

## CONCLUSION

In conclusion, it is recommended that similar studies be conducted on larger sample sizes in order to promote the use of painless labor techniques, especially regional analgesia, which is associated with fewer complications, so that the results obtained in the current study could be generalized to other populations.

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