

RESEARCH ARTICLE

Evaluating the Efficacy of Entonox in Reducing Labor Pain During Active Labor: A Case-Control Study

Pathan Amanulla Khan*, Ayesha Samreen¹, Sofia Sadaf¹, D Naga Latha², D Varun²

¹Department of Pharmacy Practice, Anwarul Uloom College of Pharmacy, New Mallepally, Hyderabad, Telangana, India

²Sri Indu Institute of Pharmacy, Sheriguda, Ibrahimpatnam, Telangana, India.

Received: 22nd March, 2024; Revised: 21st July, 2024; Accepted: 03rd August, 2024; Available Online: 31st August, 2024

ABSTRACT

The experienced of pain amid labor is women's most extreme event, which causes intemperate stress. Assorted in strength, every woman bears intensity of labor is varied. Entonox is one of the non-invasive analgesic methods used during the process and identifying its potency is the foremost article's purpose. A hospital-based prospective case control-single-centered study was done. The subject's information and feedback on entonox use were gathered and analyzed with suitable statistical SPSS. The explicit parameters of parturient were interpreted by descriptive frequencies comparison between the different variables were calculated using the T-test. Many entonox users showed positive responses with reduced pain compared to non-users. The Apgar score showed no significant variation in both I and II groups, which proves no alliance of entonox with neonatal outcomes. Entonox is a choice alternative for managing pain during the initial labor phases. The success of this preferable technique (Entonox) can be attributed to most females choosing non-intrusive methods during labor.

Keywords: Labor, Pain, Efficacy.

International Journal of Pharmaceutical Quality Assurance (2024); DOI: 10.25258/ijpqa.15.3.34

How to cite this article: Khan PA, Samreen A, Sadaf S, Latha DN, Varun D. Evaluating the Efficacy of Entonox in Reducing Labor Pain During Active Labor: A Case-Control Study. International Journal of Pharmaceutical Quality Assurance. 2024;15(3):1312-1315.

Source of support: Nil.

Conflict of interest: None

INTRODUCTION

The pain experienced during labor is among the women's most extreme events, which can cause undue stress.¹ Compared to other traumatic life experiences, the pain of childbirth is rated highly on the pain scale.² The intensity of pain is different, varying in strength for every woman. Three steps can be in the labor process. The first stage begins when labor commences and finishes with complete cervical dilatation and effacement up to 10 cm.³ It begins with contractions happening every 5 to 20 minutes. Then, they become more frequent. At first, the contractions last 30 to 35 seconds, but as this phase goes on, they get longer, lasting 60 to 90 seconds.⁴ The second stage is further separated by an active set of maternal expulsive attempts and a passive phase, including a gradual fall and rotation of presenting portion.⁵ The two phases of placenta separation and departure make up the third stage of labor, which begins with the fetus's birth. Poor placental separation causes the blood sinus to separate, which in turn causes postpartum hemorrhage (PPH).⁶ Visceral and stomach pain are both present during labor, and the degree of the pain rises with cervical dilation. It is correlated with the strength, length, and recurrence of the uterine contraction.⁷ Early labor

pain is categorized as visceral pain, where the pressure from the uterus is conveyed to the cervix with each contraction, stretching and distending it while stimulating nociceptive afferents.⁸ The impact of numerous pharmacological and non-pharmacological interventions on labor pain has been studied.⁹ Over several ages, people have sought a safe method of labor pain relief. Numerous techniques have been employed for this aim. Some of them are nonpharmaceutical approaches like relaxation therapy and yoga.¹⁰ For reducing labor pain, many methods are used. An archaic technique used initially in the 18th century was gas inhalation. One of the escalating procedures used nowadays as an alternative management for pain relief is nitrous oxide combined with oxygen, also referred to as Entonox. Entonox is a non-invasive analgesic that provides sedation for obstetric procedures. It is a pre-mixed homogeneous gas combination of nitrous oxide and oxygen in the ratio of 50:50 compressed in a cylinder.¹¹ Entonox may be an excellent alternative for pain sustenance because it is non-combustible, tasteless, odorless and colorless when combined with oxygen. After women withdraw from inhaling entonox, the effects start to fade quickly and disappear entirely in 5

*Author for Correspondence: aman.pathan811@gmail.com

minutes. Approximately 100% of it is expelled unmodified through the lungs.¹² It can affect the central nervous system in very few women. Entonox has a quick onset and brief half-life. It has been shown in numerous tests to be a safe and effective analgesic. This approach is helpful to patients, as the woman is in charge of breathing in.¹³ Applying Entonox during labor pain could be a step in the right direction since many nations have high cesarean birth rates among women,¹⁴ Bishop calculates that gradually, the number has exploded to over 150 hospitals in 50 birthing facilities spread throughout 33 states.¹⁵ The brain's production of Dopamine and Endorphins (hormones) control pain sensation through descending spinal and nerve pathways. As a result, labor pain is reduced to a manageable level.¹⁶ It is important to note that Entonox significantly lessens labor pain without affecting the labor process or the maternal pushing effort during delivery. Since there are few comparative studies conducted in India, this study educates pregnant women about this effectively trending gas analgesia [Entonox] and encourages them to deliver their babies naturally without experiencing excruciating labor pain.¹⁷

MATERIAL AND METHODS

The objective here is to identify the efficacy of entonox in reducing labor pain after inhalation of the gas during an active phase of labor by measuring the pain score on VAS and to find the effects of entonox on maternal-fetal outcomes along with experience of labor analgesia (Entonox) by various parturients. Study site: this study was conducted in South Indian District Hospital, Hyderabad, Telangana state (India).

Study Period

This study was a hospital-based prospective case-control single-centered study conducted from August to January 2023 for a period of 6 months in pregnant women receiving entonox during labor pain in the gynecology department of South Indian District Hospital.

Study Design

A case-control study was carried out.

Study Population

This study comprises 100 parturients, 50 patients undergoing spontaneous vaginal delivery in the absence of Entonox and 50 receiving gas. Their participation was confirmed in the written consent form. The parturients of gestational age 37 to 42 weeks who presented during their active stage of labor in the District Hospital during the study were included.

Data Collection

The selected study subject information (demographic details, obstetric data history) was gathered. The form includes demographic information like the patient's name, age, weight, inpatient number, admission, date of discharge, and past medical history. Other maternal parameters like blood pressure, temperature, pulse rate, and neonatal conditions like APGAR score, birth weight, respiratory rate, fetal heart rate, and other fetal complications. A few parameters, such as "VAS" scores and feedback questioning after the entonox

convention, were included. Pain is assessed with a visual analog scale, and regular labor ward rounds do a physical examination.

Data Analysis

To analyze the collected data, SPSS software version 28.1.1 was used. Calculation of T- test was done for comparison between the different variables; descriptive frequencies were enumerated for interpreting the explicit parameters of parturients.

Inclusion Criteria

Parturients with 37 to 2 weeks of gestational age. Patients who are incompetent in tolerating severe labor pain. Patients during the spontaneous active phase of labor. Parturients with cephalic presentation and longitudinal lie, and women including primi as well as multiparity pregnancy.

Exclusion Criteria

Pre-existing chronic illness in mothers. Fetal conditions like macrosomia previously undergone cesarean section. The presence of fetal heart rate (FHR) abnormalities and patients who were unwilling to participate in the study were excluded.

RESULTS

Hundred parturients were included in 6-month study period. The labor pain intensity and APGAR score were compared in the case series and control series. The side effects, feedback and efficacy of Entonox were recorded and shown in Figure 1.

Figure 2 shows that out of 50 parturients in the case, 80% (n=40) parturients had a very severe pain score of 7-8, while 16% (n = 8) parturients with a 6 to 8 severe pain score and only 2% (n = 2) had 9-10 worst pain. In the control group of 50 subjects, 95.45% (n = 47) had the worst pain on the pain scale, and 4.55% (n = 3) had very severe pain.

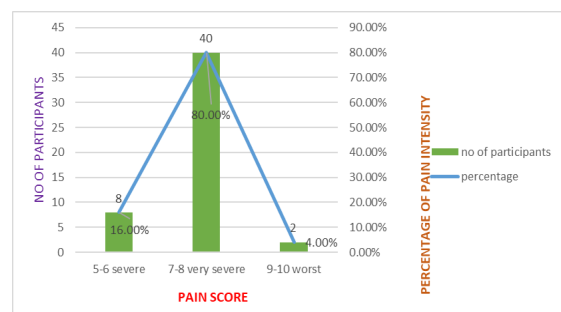


Figure 1: pain intensity in case group

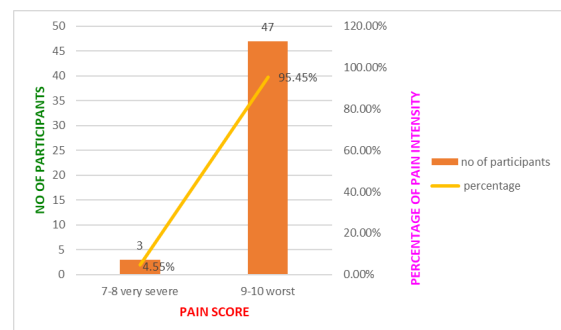


Figure 2: Pain intensity in the control group

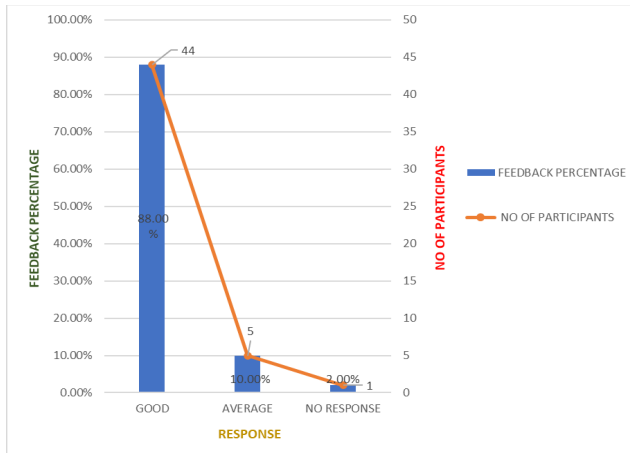


Figure 3: Distribution of subjects according to entonox feedback

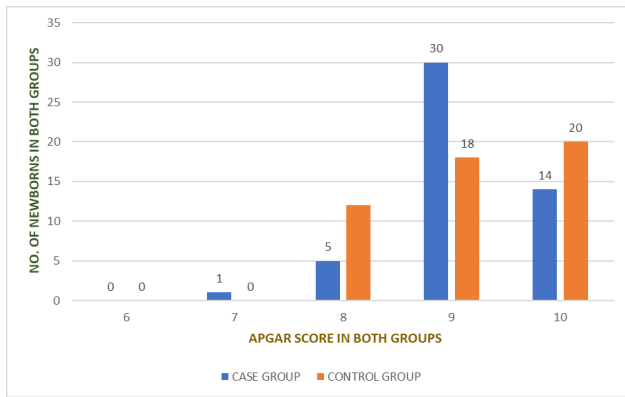


Figure 4: Comparison of apgar score in case group and control group

The column bar graph represents the distribution of case parturients based on the response upon administration of Entonox; 88% (n = 44) of them had good feedback, 10% (n= 5) recorded average feedback, and only 2 % (n= 1) were not fully satisfied showed no response on usage were depicted in Figure 3.

The foremost rating, i. e 7 in one of the batches was 2% (n = 1), and in the other was 0%. The Apgar score 10 in the case group was 28% (n = 14), and in control, it was found to be 40% (n = 20), Followed by score 9 in the case batch was 60% (n = 30), and in control was depicted to be 36% (n = 18). Whereas the Apgar 8 value in batch 1 was 10% (n = 5); in batch 2, it was 24% (n = 12). None of the above groups had Apgar value six was shown in Figure 4.

The pie chart depicts the distribution of parturients depending on maternal effects after receiving Entonox gas. Most of the subjects, i.e., 90% (n= 45), had no effect due to Entonox use. While 6% (n =3) had dizziness and 4% (n = 2) had nausea which is shown in Figure 5.

The association between average pain intensity within the subjects of case study before and after inhalation of the gas had a highly significant association with a *p-value* of 0.000. Our study showed 7.12 ± 0.650 in Entonox users in contrast to prior use of the gas.

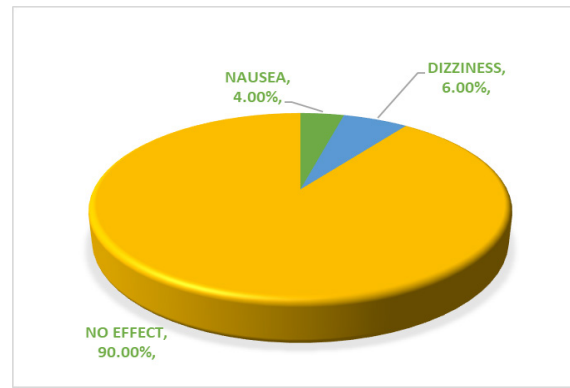


Figure 5: Distribution of subjects according to side effect

Table 1: Co-Relation of pain intensity among the parturients administering entonox gas (Case Group)

Mean pain Intensity	Group 1	Group 2	<i>p-value</i>
	7.12 ± 0.65	9.66 ± 0.51	0.00

Table 2: Association between intensity of labor pain in subjects of case group 1 & control group 2

Mean pain Intensity	Group 1	Group 2	<i>p-value</i>
	7.12 ± 0.65	9.66 ± 0.51	0.00

Table 3: Association between apgar score of entonox delivery [Case] andnon-entonox delivery [Control]

Mean apgar score	Case	Control	<i>p-value</i>
	9.14 ± 0.67	9.16 ± 0.79	0.878

The comparison of the two groups' average pain intensity had a significant association with a *p-value* of 0.00. This study compared the mean intensity of pain 7.12 taking entonox (group1) with 9.66 ± 0.51 of group 2 individuals.

The Apgar score of newborns in both batches was almost similar. No significant association (*p* = 0.87) has prevailed between Apgar and Entonox utilization.

DISCUSSION

Fretfulness, impatience, and agitation are the primary cause of cesarean births. Usually, in developed economies, regular painless deliveries are progressively replacing c-sections. Whereas in developing countries like India occurrence of c-sections is rising intermittently; hence, diverse practices have been opted in these times. This study aims to evaluate the inhalation of analgesia [Entonox] by a prospective case-control study. Our study recorded the mean pain potency in the case group as 7.12 ± 0.65 and 9.660 ± 0.52 for the control group. It has also reported Entonox as a beneficial method for pain reduction compared to non-users. Relatively to this study conducted by Mukhopadhyay. I, engaged patients in two

batches in which Wong-Baker faces values were taken for pain assessment. The referent batch results were very similar to ours. In other groups, it was comparatively less, because the pain alleviation slid to 4.490 upon complete dilation. In a similar study by P. Parsa, the average pain in members of Entonox was highly abated during the final hours of labor. On the other hand, in contrast to N.B., Devendra's study has recorded significantly less significant differences among the groups because Entonox also shortened the active labor phase in addition to analgesic properties. Our analysis of neonates Apgar's mean score in two of the groups showed no significant difference ($p = 0.88$). Analogous to our results B.N. Devendra *et al.* end results also revealed no significance with ($p = 0.995$). Similarly, Agaah *et al.*, in their analysis, showed no association between Entonox and APGAR in the newborn. Our examination for side effects was minimal in Entonox inhalers, just 4% with nausea and 6% with dizziness, comparably in Lakshmisri. N *et al.* study viewed minor and temporary nominal effects; only 10% had vomiting & 10% with drowsiness. This is because Entonox is short-lived and lacks evidence for absorption in the body. Our present study data for Entonox- feedback and satisfaction manifested; maximum individuals with the good satisfaction rate (88%) followed (10%) with average response rate and rest (2%) were unsatisfied. Identical to this, Pasha. H *et al.* study demonstrated that a vast number of patients i.e (98%) taking Entonox experienced decreased pain and were satisfied, and just 2% of them weren't appeased.

CONCLUSION

Entonox is the best alternative for pain management during the early labor phases. The success of these alternative techniques, like entonox, may be attributed to the fact that many females choose non-intrusive techniques during labor. Patients can cease using it immediately when not required by regulating its quantity. It can be typically used only upon contractions. It is a diffusible gas yet doesn't cross the placenta; thus, neither the neonate's systemic circulation nor the neurological system is affected, and even there are no severe complications for the mother. Entonox is affordable and comes in a sleek cylinder that does not require a spacious setting so it can be used in every maternity hospital. We witnessed a positive, satisfactory outcome among the utmost users; hence, the prevalence of entonox consumption shall be implemented globally.

REFERENCES

1. Devendra B. Naddoni, Seema K. Balakundi, Kammappa K. Assainar .The effect of nitrous oxide (entonox) on labor march 2016 [cited 2022 Oct 29, 12:00pm]. Available from <http://dx.doi.org/10.18203/23201770.ijrcog2016054>.
2. Simona Labor and Simon Maguire. The Pain of Labor. 2008 Dec [cited Oct 29, 12:55 pm]. Available from <https://doi.org/10.1177/204946370800200205>
3. Julia Hutchison; Heba Mahdy; Justin Hutchison. Management of Second Stage of Labor. september 2022 [cited Oct 29, 1:04pm] Available from <https://www.ncbi.nlm.nih.gov/books/NBK544290/>.
4. Joanne stone, keith edllemen, Mary Duenwald. The First Stage of Labor.March 2016 [cited Nov 8, 12:16pm] Available from <https://www.dummies.com/article/body-mind-spirit/physical-health-wellbeing/pregnancy/general-pregnancy/the-first-stage-of-labor-14947>
5. Maria Oikonomou, Edwin Chandrarahan. Management of Second Stage of Labor. September 2022 [cited Oct 29 ,1:10 pm]. Available from <https://www.glowm.com/article/heading/vol-11--labor-and-delivery- management-of-second-stage-of-labor/id/415143#Y1zYaa>
6. Mahboubeh Taebi, Masoumeh Abedzadeh Kalahroudi, Zohreh Sadat, and Farzaneh Saberi, The duration of the third stage of labor and related factors. Febuary 2017 [cited Oct 29 , 1 : 15 pm] Available from : <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3696975/> .
7. Nancy K lowe. The nature of labor pain. 2002 may [cited oct 29, 1:01pm]. Available from [https://www.ajog.org/article/S0002-9378\(02\)70179-8/fulltext](https://www.ajog.org/article/S0002-9378(02)70179-8/fulltext)
8. Peterson, mikaela M Nitrous Oxide as Pain Relief for Women in Labor 2020 may [cited oct 30 , 1 : 12pm]. Available from : <https://soar.suny.edu/handle/20.500.12648/6846>
9. Susan H noorily , labor pain – an overview. 2008 [cited oct 30 , 2:00pm] Available from : <https://www.sciencedirect.com/topics/medicine-and-dentistry/labor-pain>
10. Hajar Pasha , Zahra Basirat,Mahmood Hajahmadi ,Afsaneh Bakhtiari ,Mahbobeh Fara-marzi ,Hajar Salmalian Maternal Expectations and Experiences of Labor Analgesia With Nitrous Oxide. June 2012 [cited Oct 29 , 1:31pm]. Available from : <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3587869/>.
11. Indrani Mukhopadhyay, Pruthvi Raj , Rohit Aggarwal. A Randomized Controlled Trial of Entonox and Oxygen in Labor Analgesia, 2021 [cited Oct 29 , 1: 45pm] . Available from : <https://doi.org/10.5005/jp-journals-10006-1868>.
12. Jila Agah, Roya Baghani, Seid Hossein Safiabadi Tali and Yaser Tabarraei. Effects of Continuous Use of Entonox in Comparison with Intermittent Method on Obstetric Outcomes: A Randomized Clinical Trial. 2014 [cited on Oct 29 , 1: 53 pm] <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4267458/>
13. Parisa Parsa, Nafiseh Saeedzadeh,Ghodratallah Roshanaei, Fatameh Shobeiri, and Faryar Hakemzadeh. The Effect of Entonox on Labor Pain Relief among Nulliparous Women: A Randomized Controlled Trial. March 2017 [cited Oct 29 , 2:12pm] . Available from : <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5427378/>
14. Sarah braid. April 2020[cited 30Oct, 11:27am]. Available from: <https://www.nytimes.com/2020/04/15/parenting/pregnancy/nitrous-oxide-laughing-gas-labor.html>
15. Sri. lakshmi N. *et al.* Nagamani T *et al.* Study on Efficacy of Entonox- In Labor Pain Management, Its Maternal Complications and Fetal Outcome.2020 [cited 2022 Nov 4]. Available from: DOI: <https://doi.org/10.5281/zenodo.4323211>
16. Al-Jassani MJ, Hasan SY, Adnan A, Allela OQB, Alsaraf KM, Kadhim AJ, Abdulwahid AS. The Effect of Contraceptive Pills on the Physiological Parameters of Blood and Hormones on Women in Al-Qurna, Iraq. International Journal of Pharmaceutical Quality Assurance. 2023;14(4):853-855.
17. Patil Y, Havle PA, Raje SV, Shinde G. Preterm Labor with Side Effects: Compare the Effectiveness of Magnesium Sulfate (MgSO4) with Isoxsuprine. International Journal of Pharmaceutical Quality Assurance. 2023;14(3):786-790.