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Effect of Entonox on Duration of First Stage and Cervical Dilatation in Women During Labour

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Abstract

Introduction: Labour pain is one of the most severe types of pain ever to be experienced. Entonox is a nitrous oxide (N_2O), a self administered patient controlled inhalational analgesia. Our research is focused to study about this aspect of Entonox that is reduction in the duration of labour by making cervical dilatation faster. The aims and objectives of our study was to determine the effect of entonox on duration of first stage of labour and to determine the effect of entonox on rate of cervical dilatation.

Methodology: A prospective observational study was carried out Pushpagiri Institute of Medical Sciences and Research Centre in Kerala, India, for a period of 6 months consecutive *sampling:* sample size obtained is 20 per group, grouped them into two groups depending upon the analgesic of choice. The study tool was a Performa and variables entered into Microsoft excel spreadsheet and analysed SPSS 18.0 software package. Results presented as frequency and percentages for categorical data and descriptive statistics for continuous data. The duration of labour was presented as mean and SD and cervical dilatation rate is calculated as cm in dilatation divided by duration of first stage and this also was presented as mean and SD. These two outcome variables was compared between entonox and control Mann-Whitney U Test.

Results: There was 20 study participants each in the two groups. 10 primigravidas and 10 multigravidas, with mean age was 28.15 ± 2.66 years and majority of them belong to normal BMI. Although there was no difference with respect to the cervical dilatation at the onset of usage of Entonox, it was observed that there was significant reduction in the duration of labour and usage of Entonox as there was a increase in cervical dilatation rate when compared to women who chose other analgesics. All these factors also found to be statistically significant.

Conclusion: A part from analgesic effect nitrous oxide also is shown to decrease the duration of active phase of labour by making cervical dilatation faster and lowering the duration of usage of labour analgesics, which makes labour a pleasant experience for woman.

Keywords: Entonox; Labour analgesia; Cervical dilatation rate; First stage.

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INTRODUCTION

Labour pain is one of the most severe types of pain ever to be experienced.[1] Labour pain and its intensity is not the same for all women. Several factors including individual expectations of pain relief, anxiety, past experiences and age affects labour pain. These factors may enhance or reduce the mother's feeling of pain and to lerance.[2] Reducing the intensity of labour pain is a way of encouraging women to go for normal vaginal delivery.[3] Several methods has been used to reduce the experience of labour pain and thereby ensuring a painless or less painful experience.

Labour analgesia can be given in the form of epidural analgesia, inhalational analgesia (entonox) or as intramuscular or intravenous injections. Entonox is a nitrous oxide (N_2O), a self administered patient controlled inhalational analgesia. It is found to be of higher satisfaction from its users in labour as its onset of action is within 30 seconds and action peaks in 1 minute of administration. It has been observed that entonox has an ability to decrease labour duration both in primigravida and multigravida thereby affecting the cervical dilatation rate to attain full cervical dilatation to 10 cm.

Our research is focused to study about this aspect of Entonox that is reduction in the duration of labour by making cervical dilatation faster.

The aims and objectives of our study was to determine the Effect of entonox on duration of first stage of labour and to determine the Effect of entonox on rate of cervical dilatation.

MATERIAL AND METHODS

A prospective observational study was carried out Pushpagiri Institute of Medical Sciences and Research Centre in Kerala, India, for a period of 6 months, from March 2021 to August 2021. After taking permission from Institutional ethical committee, the study was ethically conducted as per the Declaration of Helsinki. All antenatal women in labour who opted to use entonox as the only labour analgesia and who opted for other methods of labour analgesia on the same day were matched according to their parity. The inclusion criteria were primigravida/multigravida with singleton pregnancy, age group of 20-40 years, cephalic presentation in latent/active phase of labour (cervical dilatation ≥4cms). The exclusion criteria were macrosomia, contracted pelvis, repeat caesarean section, fetal distress, polyhydromnios, oligohydramnios, multiple pregnancies and those with contraindication to entonox. Sample size was calculated using mean and SD of duration of first stage of labour for entonox from control group of previous study (64.80+/-25.60),[4] confidence interval of 99% and power of the study as 90%, sample size obtained is 20 per group. Consecutive sampling was done according to the inclusion criteria and grouped them into two groups depending upon the analgesic of choice. The study tool was a Performa and variables analysed were age, history, Body Mass Index (BMI), duration of administration of entonox, cervical dilatation and duration of labour, mode of delivery. The data was documented in Microsoft excel spreadsheet. The data was analysed with SPSS 18.0 software package and presented as frequency and percentages for categorical data and descriptive statistics for continuous data. The duration of labour was presented as mean and SD and cervical dilatation rate is calculated as cm in dilatation divided by duration of first stage and this also was presented as mean and SD. These two out come variables was compared between entonox and control Mann-Whitney U Test.

RESULTS

Out of the antenatals that delivered during those 6 months, 20 women each (10 primigravidas and 10 multigravidas) were selected and grouped into two

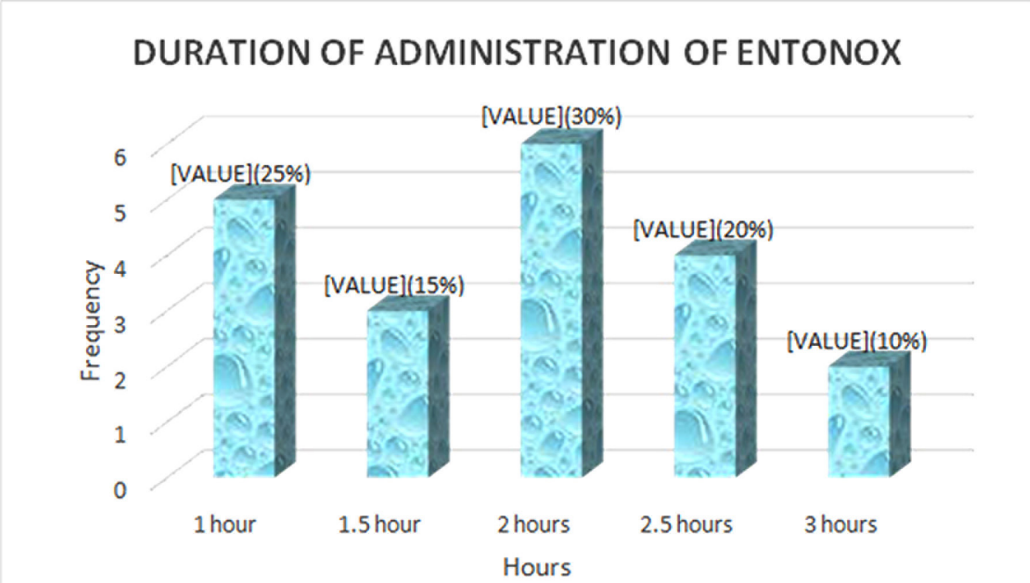
Table 1: Patient Details

Details	Entonox group (n %)	Other analgesics group (n %)
Age		
Less than 30 years	14 (70%)	13 (65%)
30 years and above	6 (30%)	7 (35%)
Mean ± SD	28.15 ± 2.66	28.15 ± 4.86
Parity		
Primigravida	10 (50%)	10 (50%)
Multigravida	10 (50%)	10 (50%)

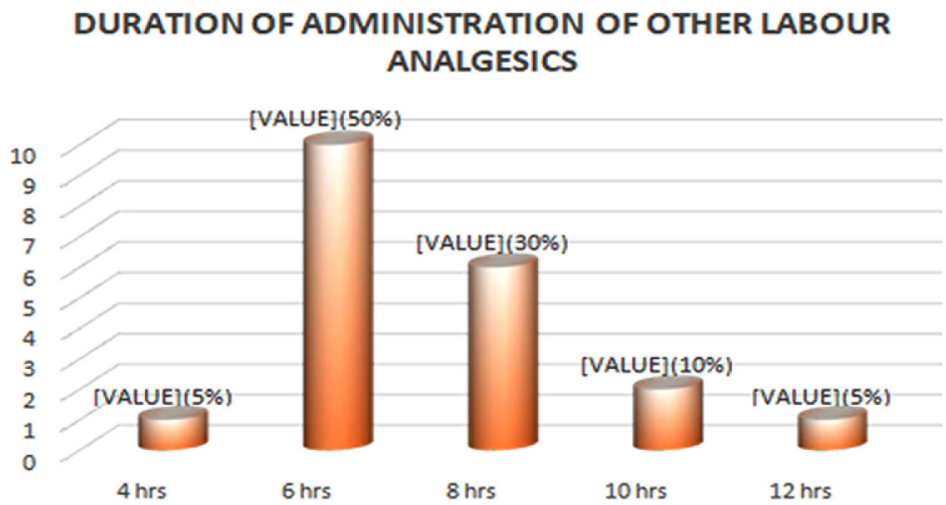
BMI		
Normal	10 (50%)	11 (55%)
Overweight	10 (50%)	9 (45%)
Mean ± SD	25 ± 2.93	24.85 ± 2.01

Majority of the study participants of both the groups belonged to the age group more than 30 years. There was equal number of primigravidas and multigravidas. 50 percent of study subjects under Entonox group was under the normal BMI group and 55 percent of the other analgesic group were under normal BMI with mean and standard deviation of 25 ± 2.93 and 24.85 ± 2.01 each.

Fig. 1: Duration of Administration of labour analgesics



In this figure the duration of administration of Entonox was a maximum of 2 hours by 30% of study participants.



In this figure, majority of the patients i.e., 50% has used other labour analgesics for a duration of 6 hours.

Table 2: Cervical dilatation at the onset of drug usage

Cervical Dilation	Entonox (n %)	Other Analgesics (n %)
3 cm	0	3 (15%)
4 cm	8(40%)	7 (35%)
5 cm	9(45%)	7 (35%)
6 cm	3(15%)	3 (15%)
Total	20(100%)	20 (100%)
Mean ± SD	4.75± 0.716	4.50± 0.94

Most of the study participants in both the groups had a cervical dilatation of 5cm at the onset of usage of labour analgesia of their choice.

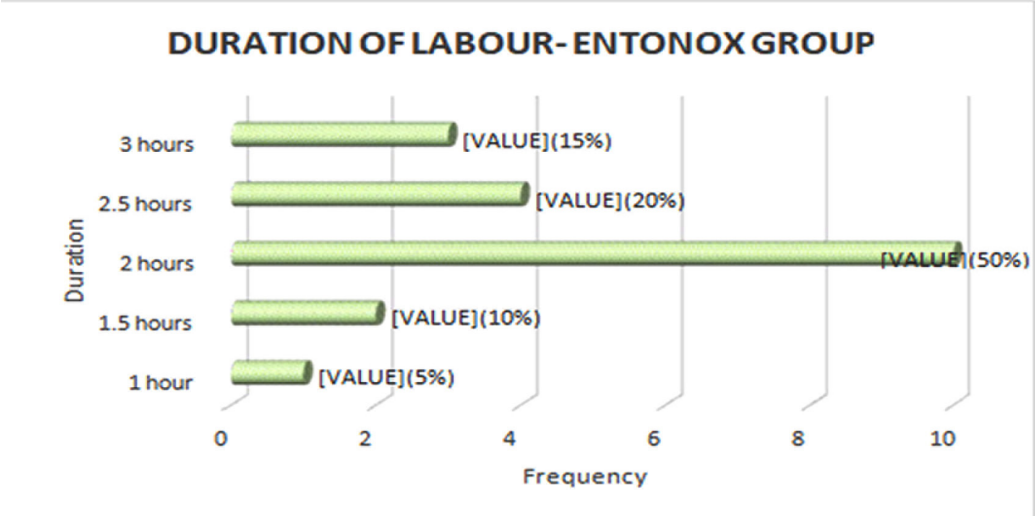
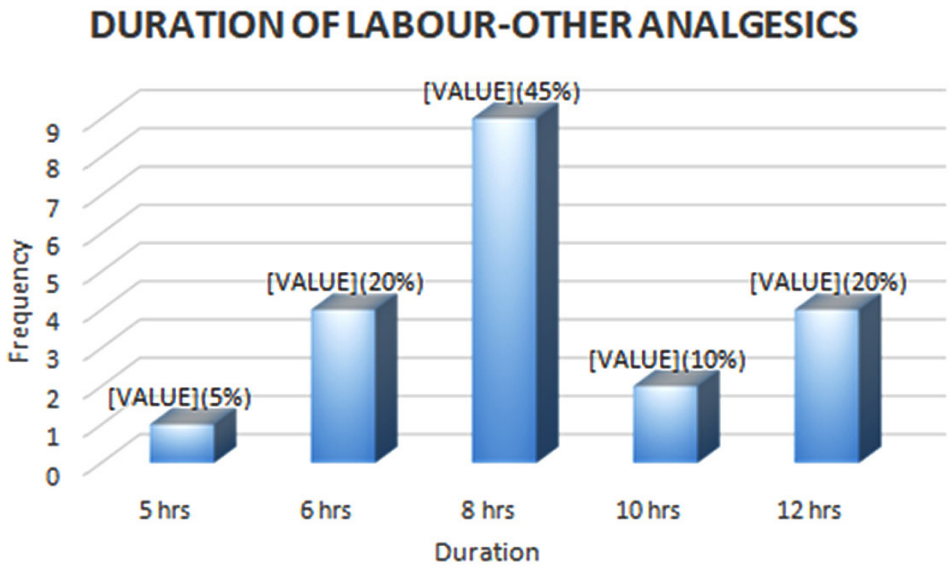


Fig. 2: Duration of labour



Under the Entonox group, maximum participants had a duration of 2 hours following the usage of Entonox whereas, 45% of study participants who used other labour analgesics had a duration of 8 hours.

Table 3: Cervical dilatation rate

Dilatation Rate	Mean	SD	Median	Minimum	Maximum
Entonox Group	2.410	1.0400	2.250	1.3	6.0
Other Analgesics Group	0.58	0.23	0.56	0.25	1.20

In Entonox group, mean and standard deviation of cervical dilatation rate is 2.410± 1.04 cm/hr and in other analgesics group it is 0.58 ± 0.23 cm/hour. That is, Entonox group has a faster dilatation rate.

Table 4: Mode of delivery

Mode of delivery	Entonox Group	Other Analgesics Group
Vaginal delivery	17 (85%)	15 (75%)
Caesarean section	3 (15%)	5 (25%)
Total	20 (100%)	20 (100%)

Majority of the study participants in both the group had vaginal delivery as their mode of delivery.

Table 5: Comparison between entonox group and control group

	Entonox Group	Other Analgesic Group	P Value
5A: Comparison of duration of administration of drug between entonox group and control group			
Mean ± Std. Deviation	1.87 ± 0.66	7.20 ± 1.88	
Median	2.00	6.00	<0.001*
Minimum - Maximum	1.0 – 3.0	4.0 – 12.0	
5B: Comparison of cervical dilation between entonox group and control group			
Mean ± Std. Deviation	4.75 ± 0.71	4.50 ± 0.94	
Median	5.00	4.50	0.445
Minimum - Maximum	4.0 – 6.0	3.0 – 6.0	
5C: Comparison of duration of labour between entonox group and control group			
Mean ± Std. Deviation	2.15 ± 0.51	4.50 ± 0.94	
Median	2.00	4.50	<0.001*
Minimum - Maximum	1.0 – 3.0	3.0 – 6.0	
5D: Comparison of dilation rate between entonox group and control group			
Mean ± Std. Deviation	2.41 ± 1.04	8.45 ± 2.21	
Median	2.25	4.50	<0.001*
Minimum - Maximum	1.33 – 6.0	5.0 – 12.0	

On comparing the two groups: Entonox and other analgesic groups there was no statistical significance for the cervical dilatation between them, but the duration of usage of Entonox, duration of labour and the cervical dilatation rate was statistically significant since p value < 0.05 (Mann Whitney U test). *That is in Entonox group:* The duration of usage of Entonox was lesser with faster cervical dilatation rate. Hence, decreasing the duration of labour.

groups with respect to labour analgesic of choice.

DISCUSSION

The American college of obstetricians and gynecologists reaffirmed its joint postion with American society of anesthesiologists that a woman's request for labour pain relief is sufficient medical indication for its provision.[3] Entonox, a 50:50 mixture of oxygen and acts by non competitive in hibiton of N-methyl-D as partate type of glutamate receptors. The mechanism of its action is probably release of endorphin and dopamine in the brain which modulates pain stimuli via descending spinal and nerve pathways and in consequence reduces labour pain to a tolerable level.[5-7] In our study, the majority of study participants were under the age group of 30 years and had normal range of BMI which is a reflection of the reproductive age group of women in India.[8] There was a drastic difference in the duration of usage of Entonox and other analgesics in our study, i.e., a majority of our study participants who opted for Entonox used it for an average of 2 hours where as other labour analgesics had to be used for atleast 6 hours. Though there was not much a difference regarding the cervical dilatation at the onset of usage of labour analgesia, there was significant difference in the cervical dilatation rate in both groups. It was seen that labour progressed faster in Entonox group than for the study particiants who opted for other method of labour analgesia. These values corroborates with studies by Naddoni et.al. who studied in women who opted for Entonox in Kerala, mean duration of active phase of labour was significantly lower in the entonox group compared to the control group (3.06 hours versus 3.96 hours). Similar result was noted by Tazarjani et al, that duration of active phase of labour in entonox group was shorter than control group (4.17 hour versus 5.07 hour, $p<0.05$).[9,10] In the RCT by Parsa P et al. also found out that the duration of labour in the entonox group (64.80 minutes) was significantly shorter than the control group (98.33 minutes) ($p<0.05$), this corroborates with the findings of our study that duration of labour was shorter and was statistically significant. Other salient statistically significant findings of our study are, there was a decrease in duration in usage of Entonox and cervical dilatation was faster irrespective of the cervical dilatation at onset of usage of Entonox and there by cutting down the duration of first stage of labour.

CONCLUSION

Entonox provides significant pain relief and it can quickly be implemented during painful labour. Apart from analgesic effect nitrous oxide also is shown to decrease the duration of active phase of labour by making cervical dilatation faster and lowering the duration of usage of labour analgesics, which makes labour a pleasant experience for woman.

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Conflict of interest

The authors declare that there is no conflict of interest regarding financial matters or personal relationships that could have influenced the work reported in this paper.

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