ORIGINAL RESEARCH

Comparative Analysis of High-Dose vs. Low-Dose Oxytocin for Augmenting Labor: A Study

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ABSTRACT

Background: The augmentation of labor is a medical practice employed to enhance uterine contractions concerning their duration, frequency, and intensity. The primary aim is to reduce the duration of labor and minimize potential adverse outcomes for both the mother and the fetus that might result from prolonged labor. Oxytocin, a hormone and medication, is the most commonly used drug for this purpose. However, it's worth noting that there isn't a universally accepted standard dosage regimen for oxytocin. **Methods**: In this study, a total of 200 patients who were in active labor and exhibited inadequate uterine contractions were included. To ensure unbiased results, the patients were selected randomly, with every other case being assigned to receive either a high dose or a low dose of oxytocin for labor augmentation. Throughout the labor process, the patients were closely monitored, and the outcomes of the two groups were systematically compared. **Results**: In this study, it was observed that the majority of patients in both the high dose and low dose oxytocin groups delivered vaginally, with 78% in the high dose group and 90% in the low dose group. The mean duration of augmentation to delivery was quite similar between the two groups, with 7.20 hours for the high dose group and 7.45 hours for the low dose group. However, it's worth noting that a small percentage of patients (12%) in the high dose group experienced maternal complications, while none were encountered in the low dose group. **Conclusion**: In summary, the study's conclusion suggests that using a high dose regimen of oxytocin can lead to a reduction in the duration of labor. However, this advantage in terms of shorter labor was counterbalanced by a higher rate of cesarean sections and an increased incidence of maternal and fetal complications. On the other hand, while the low dose regimen did not result in a significant reduction in the duration of labor, it showed a lower rate of cesarean sections and fewer complications for both mothers and babies.

Keywords: Oxytocin, Labour, Augmentation-delivery interval, Maternal outcome, Fetal outcome

INTRODUCTION

Labor augmentation is a medical intervention used when the progress of labor is slower than expected, and it typically involves the use of medications or procedures to increase the strength and frequency of contractions[1]. The aim is to help the cervix dilate and the baby descend through the birth canal more efficiently, ultimately reducing the time spent in labor and associated risks.The most commonly used medication for labor augmentation is oxytocin, a hormone that naturally stimulates uterine contractions during labor.[2] Oxytocin can be administered at different dosage regimens, and this study aimed to compare the outcomes of two widely accepted dosage regimens – a high dose and a low dose – to understand their advantages, disadvantages, and potential complications.The study included 200 patients in active labor who had inadequate uterine contractions. These patients were randomly assigned to receive either the high dose or the low dose regimen of oxytocin. The researchers monitored the patients throughout their labor and analyzed various aspects, including the time from augmentation to delivery, the mode of delivery (vaginal or cesarean), and maternal and fetal outcomes.The findings revealed that a high dose of oxytocin led to a shorter duration of labor. However, it also resulted in a higher rate of cesarean sections and an increased incidence of maternal and fetal complications. In contrast, the low dose regimen did not significantly reduce the duration of labor but

had a lower cesarean section rate and fewer complications for both mothers and babies[3,4].

The study concluded that neither regimen had an absolute advantage over the other, highlighting the importance of carefully considering the benefits and risks associated with the dosage of oxytocin for laboraugmentation.Ultimately, the choice between high and low dose oxytocin regimens should be made on a case-by-case basis, taking into account the specific needs and conditions of the laboring patient.Labor augmentation is a complex decision-making process in obstetrics. It involves enhancing uterine contractions when they are considered inadequate, either due to slow cervical dilation or delayed fetal descent. The reasons for initiating labor augmentation can vary and may be influenced by multiple factors, including maternal and fetal health, labor progress, medical conditions, and institutional guidelines. Healthcare providers play a crucial role in assessing each patient's unique situation and determining the most appropriate course of action, considering both potential benefits and risks. While there is no universal protocol for labor augmentation, healthcare institutions rely on a combination of clinical judgment and existing research evidence to guide their practices. It is essential to prioritize the well-being of both the mother and the fetus while involving the patient in shared decision-making regarding labor augmentation[5]. Ultimately, the aim is to ensure safe and effective labor progression while minimizing potential adverse outcomes associated with prolonged labor.Oxytocin is a critical hormone and medication used in obstetrics for labor induction and augmentation. However, there is no standardized oxytocin protocol, and healthcare providers often make decisions about dosages based on their clinical judgment and specific institutional guidelines. The choice between high and low dose oxytocin regimens varies among obstetricians, and these regimens have different effects and potential complications.

High-dose oxytocin protocols tend to result in more vaginal births, shorter labor duration, and lower cesarean section rates. They may also reduce the incidence of chorioamnionitis, an infection of the fetal membranes. However, high-dose oxytocin is associated with an increased risk of hyperstimulation, a condition where the uterus contracts too frequently or too strongly. This can lead to complications and adverse outcomes[6].On the other hand, low-dose oxytocin regimens are often used to minimize the risk of hyperstimulation and its associated complications. However, they may not be as effective in promoting vaginal birth and shortening labor. This study aims to compare the two regimens and assess their respective advantages, disadvantages, and complications, providing valuable insights into the optimal use of oxytocin for labor augmentation.Research in this area is essential to guide healthcare providers in making informed decisions about the best oxytocin regimen for their patients, considering individual factors and circumstances while ensuring safe and effective labor management.

MATERIAL AND METHODS

This comparative study was conducted over a period of two years and involved a total of 200 patients.. The study focused on women in labor who had inadequate uterine contractions. These patients were selected and randomly assigned to either the high dose oxytocin group (Group A) or the low dose oxytocin group (Group B), with 100 cases in each group.The inclusion criteria for the study encompassed patients with singleton pregnancies who were in the active phase of labor.[7] Specifically, these patients had a cervical dilatation of 4-5cm and an effacement of 30% or more. The study included both primigravidae (women pregnant for the first time) and multiparae (women who had previously given birth).The study aimed to investigate and compare the effects and outcomes of high dose and low dose oxytocin regimens in these laboring patients, with a focus on their progress in labor, mode of delivery, and maternal and fetal outcomes. Such research is valuable for informing clinical practices and improving the care of laboring women.In this study, certain groups of patients were excluded due to specific medical conditions or circumstances[8]. Patients with non-reassuring fetal heart rate patterns, severe fetal growth restriction, severe preeclampsia or eclampsia, uncontrolled diabetes mellitus, cephalopelvic disproportion, and those who had previously undergone a cesarean section were not included in the study.

For the patients allocated to Group A, they were given a high dose of oxytocin, which started with an initial dose of 4mU/min. This initial dose was then escalated by 4mU/min at 30-minute intervals until either adequate uterine contractions were achieved or a maximum dose of 36 mU/min was reached. The infusion rate was adjusted using a dial-flow meter.On the other hand, patients allocated to Group B were administered a low dose of oxytocin[9]. This regimen began with an initial dose of 2 mU/min, and this dose was similarly escalated by 2 mU/min at 30-minute intervals until achieving adequate uterine contractions or reaching a maximum dose of 36 mU/min.The study aimed to assess and compare the outcomes and effectiveness of these high and low dose oxytocin regimens for the augmentation of labor in the selected patient population. Such research helps to provide valuable insights into the best practices for managing labor and improving maternal and fetal outcomes.Augmentation-delivery interval, mode of delivery, any occurrence of PPH and neonatal outcome were recorded. Data was entered in excel sheet, tabulated and analysed. quantitative data summarised by using mean and SD. Qualitative data summarised by using proportions. Appropriate tests of statistical significance such as Chi- square test were used.

RESULTS

The study's analysis of patient demographics revealed that the age distribution in the high dose and low dose oxytocin groups was quite similar, with no significant difference in mean age between the two groups.[10] Most patients belonged to the middle socioeconomic class, indicating a diverse representation. Additionally, the study included both primigravidae and multiparae, ensuring that women at different stages of their reproductive experiences were considered. Hemoglobin levels were assessed, and the majority of participants had mild to moderate anemia, further emphasizing the diversity of the patient population. Understanding the demographic characteristics of the study participants is essential in interpreting the results and their potential applicability to a broader population of pregnant women. It helps researchers and healthcare providers determine the relevance and generalizability of the study's findings to various patient groups, contributing to a more comprehensive understanding of the outcomes associated with different oxytocin dosing regimens in labor augmentation.

Table 1: Distribution of participants based on period of gestation (n=100)

Variable	Dose of oxytocin	
Period of gestation (weeks)	**High dose**	**Low dose**
	15	15
36 to 36.6	8.0%	8.0%
	21	20
37 to 38.6	44.0%	40.0%
	44	45
39 to 40.6	48.0%	52.0%
Total	100	100

Table 2: Distribution of participants based on mode of delivery (n=100)

Variable	Dose of oxytocin	
Mode of delivery	**High dose**	**Low dose**
	39	45
FTND	78.0%	90.0%
	11	5
LSCS	22.0%	10.0%
	50	50
Total	100.0%	100.0%

Table 3: Distribution of participants based on augmentation delivery interval (n=100).

Augmentation de interval (hours)	Dose of oxytocin		Augmentation delivery interval (hours)
Mode of delivery	**High dose**	**Low dose**	
	44	36	
≤6	44%	36.0%	
	46	50	
7-9	46%	50.0%	
	5	14	0.664
10-12	10%	14.0%	
	100	100	
Total	100%	100.0%	

The study results indicate a statistically significant difference (p=0.027) in the mean augmentation-delivery interval between the high dose and low dose oxytocin groups. However, when neonatal complications were evaluated, no statistically significant differences were observed in the 1-minute and 5-minute APGAR scores between the two groups. The vast majority of neonates in both groups, 88% in the high dose group and 86% in the low dose group, did not experience any neonatal complications.[11]These findings suggest that while there may be differences in the duration of labor between the two oxytocin dosing regimens, they do not appear to significantly impact neonatal well-being, as evidenced by the similar APGAR scores and the low incidence of neonatal complications. This information is valuable for clinicians and healthcare providers in determining the safety and efficacy of different oxytocin dosing strategies for labor augmentation and their potential impact on neonatal outcomes.

DISCUSSION

In our study, we observed that the demographic parameters were quite similar between both groups, and there were no statistically significant differences.[12,13] The distribution of primigravidae and

multigravidae was almost equal, with 47% primigravidae and 53% multigravidae in both groups. The mean gestational age of the participants in our study was approximately 38.4 weeks for the high dose group and 38.7 weeks for the low dose group.When assessing the presence of anemia in our study, we found that approximately 30% of patients in the high dose group and 34% in the low dose group had severe anemia with a hemoglobin level of 9 gm% or less. Moreover, about 56% in the high dose group and 50% in the low dose group had moderate anemia (hemoglobin between 9-11 gm%), while 14% in the high dose group and 16% in the low dose group had normal hemoglobin levels (11 gm% and above).It's worth noting that the majority of patients in both groups exhibited moderate anemia. The difference in the anemic status between these two groups was not statistically significant, with a p-value of 0.835.[14] This indicates that the severity of anemia was quite similar in both the high dose and low dose oxytocin groups in our study.The high overall incidence of anemia in our study population can likely be attributed to poor nutrition and hygiene, which are often associated with the patients' low socioeconomic background. It is a common issue in populations with limited access to healthcare and resources.In our study, we observed that vaginal delivery was achieved in 78% of patients in the high dose group and 90% of patients in the low dose group. The requirement for cesarean section was noted in 22% of the high dose group and 10% of the low dose group. However, it's important to mention that the difference between the two groups regarding the mode of delivery was not statistically significant, with a p-value of 0.08.Overall, we achieved a higher percentage of vaginal deliveries than cesarean deliveries in both groups within this study. Among the cases that required cesarean section in the high dose group, 45% were due to non-reassuring fetal heart rate patterns (FHR). In contrast, in the low dose group, there were only five cases of cesarean delivery, and only one (20%) of those was due to non-reassuring FHR. This finding indicates that fetal heart abnormalities leading to non-reassuring FHR patterns were encountered more often in the high dose oxytocin regime compared to the low dose group[15].

In our study, the indications for cesarean sections due to non-progress of labor were 45% in the high dose group and 80% in the low dose group. Only one case in the high dose group underwent cesarean section for second-stage arrest. This discrepancy in cesarean section rates between the two groups can be attributed to variations in study populations and the specific criteria used for cesarean delivery.

It's worth noting that our study had a higher proportion of multigravidae, and we excluded patients with previous cesarean sections and those with medical complications. These factors likely contributed to the higher number of vaginal deliveries in our study[16].

Regarding the augmentation-delivery interval, we observed that 44% of patients in the high dose group and 36% in the low dose group achieved delivery within 6 hours, while 46% and 50%, respectively, delivered between 7-9 hours. For 10-12 hours, the percentages were 10% in the high dose group and 14% in the low dose group. The mean augmentation-delivery interval was 7.20 hours in the high dose group and 7.45 hours in the low dose group. Overall, the duration of labor was slightly shorter in the high dose group, but this difference was not statistically significant.

The mean difference in the reduction of labor duration in the high dose group was 25 minutes, which is consistent with findings from other studies. Wei SQ et al. reported a mean difference of 1.54 hours, Merrill et al. 2 hours, Gupta et al. 2.09 hours, and Neerukonda et al[17]. 2 hours. All of these studies reached a common conclusion that a high dose regimen of oxytocin is superior to a low dose regimen in terms of reducing the duration of labor. These findings are in line with our study results.

In our study, the common adverse perinatal outcomes observed included non-reassuring fetal heart rate patterns, the need for advanced neonatal resuscitation, the presence of thick meconium-stained liquor, and the requirement for referral to the Neonatal Intensive Care Unit (NICU). Notably, our findings were inconsistent with other studies that reported no significant difference in perinatal outcomes between different oxytocin regimens. Additionally, a study by Satin et al. demonstrated a decreased risk of neonatal sepsis with high-dose oxytocin.

Overall, our study, as well as most of the other studies, did not find a significant difference in neonatal outcomes between the high dose and low dose oxytocin groups. This suggests that neonatal outcomes are not substantially affected by the oxytocin regimen used for labor augmentation.

CONCLUSION

The results of our study, as well as findings from various other studies, including a Cochrane review, lead to the conclusion that high-dose oxytocin administration results in a slight reduction in labor duration and cesarean section rate. However, it does not significantly differ in neonatal outcomes compared to low-dose oxytocin. Importantly, it was observed that maternal complications were more common in the high-dose oxytocin group.

In summary, our study suggests that high-dose oxytocin does not offer a significant advantage over low-dose oxytocin for labor augmentation. The choice of the oxytocin regimen may be influenced by individual patient characteristics and clinical considerations, with the goal of achieving safe and effective labor augmentation while minimizing maternal complications.

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