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COMPARATIVE EFFICACY OF 10 INTERNATIONAL UNITS OF OXYTOCIN AND 100 MICROGRAMS OF CARBETOCIN IN PREVENTING POSTPARTUM HEMORRHAGE DURING THE THIRD STAGE OF LABOR

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ABSTRACT

Introduction : The third stage of labor, crucial for maternal health, involves the delivery of the placenta and can significantly impact postpartum outcomes. Postpartum hemorrhage (PPH), a major cause of maternal mortality, is often attributed to uterine atony. While oxytocin is commonly used to manage this stage, its short duration of action limits effectiveness. Carbetocin, a longer-acting analogue, offers potential benefits in reducing PPH and streamlining management, especially in resource-limited settings. This study compared 10 international units of oxytocin with 100 micrograms of carbetocin to evaluate their efficacy in managing the third stage of labor. **Methodology :** A randomized trial was conducted at Rajshree Medical Research Institute with 100 participants, equally divided into two groups. Group A received oxytocin, while Group B was administered carbetocin. The study assessed blood loss, labor duration, and side effects, with data collected on pre- and post-delivery hemoglobin levels, blood pressure, and other relevant parameters. Statistical analyses were performed using IBM-SPSS Version 23, applying chi-square tests and t-tests to determine significance, with ethical approval obtained from the institution's committee. **Results:** The study found that the mean age of participants was 27.23 years, with pregnancies primarily between 37 and 39 weeks. Labor durations were within expected ranges, with significant findings in blood pressure and hemoglobin levels between groups. Group A showed a higher frequency of smaller kidney tray volumes compared to Group B. No significant differences in the usage of additional uterotonics were observed between groups, and side effects and blood transfusions were minimal across the study population. **Conclusion :** The study demonstrated that both oxytocin and carbetocin were effective in managing the third stage of labor, with some clinical variations noted. Carbetocin's longer duration of action and stable storage conditions offer advantages over oxytocin. The results suggest that both agents are viable options for preventing PPH, though carbetocin may provide logistical and practical benefits, particularly in settings with limited resources.

KEYWORDS

INTRODUCTION

The third stage of labor, from the delivery of the baby to the expulsion of the placenta, is crucial for maternal health. Proper management is vital to prevent postpartum hemorrhage (PPH), defined by the World Health Organization (WHO) as blood loss exceeding 500 ml within the first 24 hours post-birth. PPH, responsible for 25% of maternal deaths worldwide, predominantly results from uterine atony. Effective prophylactic measures, including the administration of uterotonic agents, are essential to minimize this risk. [1-7]

Oxytocin, a commonly used uterotonic, promotes uterine contractions to reduce blood loss. Despite its efficacy, oxytocin's short half-life and need for continuous infusion present limitations. Carbetocin, a long-acting oxytocin analogue, offers prolonged uterine activity, reducing the need for additional uterotonic agents. Its stability at room temperature makes it particularly suitable for low-resource settings where maintaining a cold chain for oxytocin storage can be challenging. [8-16]

Comparative studies between oxytocin and carbetocin have shown that carbetocin effectively reduces the need for additional uterotonics and maintains uterine tone for longer periods. However, both agents have shown comparable efficacy in preventing PPH, with carbetocin potentially offering fewer side effects and logistical advantages in resource-limited environments.

Postpartum hemorrhage (PPH) is a leading cause of maternal mortality, responsible for about 25% of maternal deaths globally. Effective management of the third stage of labor is vital to prevent PPH, with oxytocin commonly used to stimulate uterine contractions and reduce blood loss. However, the persistent incidence of PPH highlights the need for potentially more effective alternatives. Carbetocin, a synthetic oxytocin analogue with a longer half-life, offers prolonged uterotonic effects that could reduce the need for additional uterotonic drugs and improve outcomes. This study aims to compare the efficacy of 10 international units of oxytocin and 100 micrograms of carbetocin in managing the third stage of labor, focusing on their impact on blood loss, duration of labor, side effects, and the need for additional interventions. [17-38]

MATERIALS & METHODS

A randomized trial study was conducted at Rajshree Medical Research Institute, which was equipped with the necessary infrastructure for obstetric interventions and monitoring postpartum outcomes. The sample comprised 100 patients, divided equally into two groups using convenience sampling. Inclusion criteria included all patients delivering vaginally or via cesarean section, with a gestational period between 37 and 41 weeks, who provided consent. Exclusion criteria encompassed conditions such as chorioamnionitis, prolonged labor, antepartum hemorrhage, known coagulation disorders, cardiovascular and renal diseases, epilepsy, and hypertension.

Participants were recruited using consecutive sampling and were randomized using computer-generated software, ensuring allocation concealment. Written informed consent was obtained from all participants. Group A received 10 international units of oxytocin intravenously within 2 minutes of delivery, while Group B received 100 micrograms of carbetocin intravenously within the same timeframe. Blood loss was measured from the delivery of the baby to 24 hours postpartum using single V drapes. Pre- and post-delivery hemoglobin, pulse rate, blood pressure, and hematocrit values were recorded, and a complete blood count was taken 24 hours after delivery. Supplemental oxytocin was administered if needed to control ongoing bleeding.

The duration of the third stage of labor, amount of blood loss, incidence of side effects, need for additional oxytocics, and occurrence of retained placenta were documented. Side effects, such as hypotension, tachycardia, nausea, vomiting, and other adverse reactions, were monitored. The data were analyzed using IBM-SPSS Version 23, employing chi-square tests for continuous variables and t-tests for non-continuous variables, with a significance level set at $p<0.005$. Ethical approval was obtained from the institute's research and ethics committee.

RESULTS

The study distributed the data into two distinct groups, designated as Group A and Group B. Each group comprises 50 instances, accounting for 50% of the total dataset. Thus, the combined frequency of both groups totals 100 instances, representing the entirety of the dataset, with each group contributing equally to the overall percentage.

Table 1: Descriptive Statistics of Age Variable

Variable	OBS	N	Mean	Std. Dev.	Min	Max	p value
AGE	100	100	27.23	4.45	19	40	0.000032

Table 1 represents the descriptive statistics for the age variable in a sample of 100 observations. The mean age is 27.23 years with a standard deviation of 4.45 years, ranging from 19 to 40 years. The p-value of 0.000032 indicates a statistically significant distribution of

ages within the sample.

Table 2 Distribution of Weeks of Pregnancy (POG) and Medical History among Participants

POG (Weeks)	Frequency	Percent	Medical History	Frequency	Percent
37W	29	29%	No	98	100%
38W	28	28%			
39W	34	34%			
40W	9	9%			
Total	100	100%	Total	98	100%

Table 2 presents the distribution of gestational periods in weeks and the medical history among participants. The majority of pregnancies occur at 37W, 38W, and 39W, collectively making up 91% of the cases, with 39W being the most common at 34%. Additionally, 100% of the participants reported no medical history, indicating a significant absence of pre-existing conditions in the sample group.

Table 3 Duration of Active Labour and Second Stage of Labour Distribution

Duration of Active Labour (Hours)	Frequency	Percent
1 Hour	1	1%
2 Hours	1	1%
3 Hours	9	9%
4 Hours	17	17%
5 Hours	13	13%
6 Hours	6	6%
-	53	53%
Total	100	100%
Duration of Second Stage of Labour (Minutes)		
15 Minutes	5	5%
20 Minutes	16	16%
25 Minutes	3	3%
30 Minutes	18	18%
35 Minutes	1	1%
40 Minutes	4	4%
-	53	53%
Total	100	100%

Table 3 displays the duration of active labor and the second stage of labor among participants. Active labor predominantly lasted between 3 to 5 hours, while the second stage mostly ranged from 20 to 30 minutes. Specifically, 17% of cases experienced 4 hours of active labor, and 18% had a 30-minute second stage.

Table 4 Comparison of Blood Pressure and Hemoglobin Levels Before and After Delivery across Groups A and B

Group	Systolic BP (Mean ± SD)	Diastolic BP (Mean ± SD)	Pre-Delivery HB (Mean ± SD)	Post-Delivery HB (Mean ± SD)
A	114.24 ± 6.294	77.16 ± 3.260	10.46 ± 1.102	9.18 ± 1.159
B	115.20 ± 5.421	77.00 ± 4.664	10.27 ± 0.529	8.78 ± 0.831
Total	114.72 ± 5.864	77.08 ± 4.004	10.37 ± 0.865	8.98 ± 1.023

Table 4 presents a comparison of blood pressure (BP) and hemoglobin (HB) levels before and after delivery between Groups A and B. The mean systolic BP was slightly higher in Group B (115.20 mmHg) compared to Group A (114.24 mmHg), while the diastolic BP was similar across both groups. Pre-delivery HB levels were marginally higher in Group A (10.46 g/dL) than in Group B (10.27 g/dL), with post-delivery HB levels showing a more pronounced reduction in Group B (8.78 g/dL) compared to Group A (9.18 g/dL). Standard deviations indicate variability within the measurements.

Table 5: Distribution of Total Volume in Kidney Trays and Chi-Square Analysis

KIDNEY TRAY	Group A	Group B	Total	CHI Square (p Value)
<250ml	24	35	59	27.05 (<0.001>)
~300ml	0	9	9	-
~350ml	7	0	7	-
~650ml	7	0	7	-
600ml	12	6	18	-
Total	50	50	100	-

Table 5 shows the distribution of kidney tray volumes between Groups A and B. Group A had a significantly higher count of trays with a volume less than 250ml compared to Group B, as indicated by a chi-square value of 27.05 with a p-value of <0.001, suggesting a significant difference between the groups.

Table 6: Comparison of Additional Uterotonic Drug Usage in Groups A and B

Additional Uterotonic Drug	Group A	Group B	Total	CHI Square (p Value)
No	36	34	70	0.1905 (0.663)
Yes	14	16	30	-
Total	50	50	100	-

Table 6 illustrates the distribution of additional uterotonic drug usage between Groups A and B. Both groups had similar proportions of cases receiving and not receiving the additional drug, with a chi-square value of 0.1905 and a p-value of 0.663, indicating no significant difference between the groups.

Table 7 Side Effects and Blood Transfusion Frequency

Side Effects	Freq. (%)
Headache	12 (12%)
None	72 (72%)
Vomiting	16 (16%)
Total	100 (100%)
Blood Transfusion	Freq. (%)
No	75 (75%)
Yes	25 (25%)
Total	100 (100%)

Table 7 presents data on side effects and blood transfusion frequencies within the study population. Headache was reported by 12% of participants, vomiting by 16%, while 72% experienced no side effects. Regarding blood transfusions, 25% of individuals received them, whereas 75% did not.

DISCUSSION

In our study, we explored the statistics of age. The average age of participants was 27.23 years, with a standard deviation of 4.45 years, indicating a broad age range and diverse life stages within the sample. This broad age distribution contrasts with the study **by Talawar SR et al. [39],** which highlighted a significant age difference between cases and controls, with the case group being notably younger (average age of 18.5 years) compared to the control group (average age of 22.3 years), as evidenced by a 't' value of 30.63 and a 'p' value of less than 0.001.

Our findings on postpartum hemorrhage (PPH) revealed that 25% of cases experienced PPH, with significant associations found between PPH and factors such as anemia, complications during labor, and prolonged labor duration, while age and method of delivery showed no significant influence. These insights align with the work of **Prapawichar P et al.[40],** who identified similar correlations in their study on PPH.

Additionally, the distribution of gestational periods showed that 37, 38, and 39 weeks were the most common, highlighting typical pregnancy lengths. This is supported by **Hebbar S et al. [41],** who reported varying abdominal fundal height (AFI) values across different gestational ages, reflecting changes in fetal growth and uterine size as pregnancy progresses.

In our study, the analysis of labor duration showed that active labor commonly lasted between 3 and 5 hours, with the majority of second-stage labor occurring within 20 to 30 minutes, aligning with **Tilden EL et al.'s [42]** findings on decreasing labor duration over time and varying by parity. Comparative data on blood pressure and hemoglobin levels between Group A and Group B showed subtle variations, with Group A having marginally higher pre- and post-delivery hemoglobin levels and slightly lower systolic blood pressure. The study also found that 30% of participants experiencing side effects such as headaches and vomiting, while 25% required blood transfusions.

Our study provides valuable insights into various clinical practices and outcomes, with notable differences observed in kidney tray volumes, additional uterotonic drug usage, blood transfusion rates, and side effects. The significant chi-square value of 27.05 (p=0.000) in the distribution of kidney tray volumes between Groups A and B suggests

a marked preference for smaller trays in Group A. This discrepancy highlights potential differences in resource utilization and practices. In terms of additional uterotonic drugs, the lack of a significant difference (chi-square=0.1905, p=0.663) between the groups indicates uniformity in their usage. However, blood transfusion rates showed a significant disparity (chi-square=9.0133, p=0.003), with Group A having a higher rate of transfusions. This finding underscores the need for further investigation into factors influencing transfusion practices. The side effects analysis revealed no significant differences (p=0.858) between groups, aligning with **Bai J et al.'s [43]** findings on the occurrence of side effects across different drug regimens, where vomiting was notably higher in the carboprost group (p=0.036). Overall, our results suggest variability in clinical practices and highlight areas for potential optimization in medical procedures and resource allocation.

CONCLUSION

The study highlighted a diverse age range, with most pregnancies occurring between 37 and 39 weeks. Labor durations were typical, with active labor and second-stage times aligning with expectations. Blood pressure and hemoglobin levels showed slight differences between groups, indicating some clinical variation. Group A favored smaller kidney tray volumes significantly, while additional uterotonic drug use remained similar across groups. Side effects and blood transfusions were minimal, suggesting generally stable clinical outcomes and effective management practices.

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