ORIGINAL RESEARCH PAPER
Volume - 15 | Issue - 08 | August - 2026 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF CARBETOCIN IN PREVENTION OF POSTPARTUM HEMORRHAGE- A RANDOMISED CONTROLLED TRIAL

Obstetrics & Gynaecology

Dr. Laveena Gosai Junior Resident, Department of Obstetrics and Gynaecology, Rohilkhand Medical College and Hospital, Bareilly

Dr. Shobha Mukherjee Professor, Department of Obstetrics and Gynaecology, Rohilkhand Medical College and Hospital, Bareilly

Dr. Jairath Nikki Brijbhushan Junior Resident, Department of Obstetrics and Gynaecology, Rohilkhand Medical College and Hospital, Bareilly

Dr. Sanchita Kochhar Junior Resident, Department of Obstetrics and Gynaecology, Rohilkhand Medical College and Hospital, Bareilly

ABSTRACT

Background: Postpartum hemorrhage remains a major contributor to maternal morbidity, primarily due to uterine atony. Effective uterotonic agents are essential for prevention, and carbetocin, a long-acting oxytocin analogue, has been proposed as a potential alternative to conventional therapy. **Objectives:** To evaluate the efficacy of carbetocin in preventing postpartum hemorrhage, assess its adverse effects, and compare its effectiveness with oxytocin. **Materials and Methods:** This prospective randomized controlled trial included 78 women undergoing vaginal delivery or cesarean section. Participants were randomly allocated into two groups: carbetocin (100 µg IM) and oxytocin (10 IU IM), administered after delivery. Outcomes assessed included postpartum blood loss, need for additional uterotonics, blood transfusion requirement, and changes in hemoglobin and hematocrit. **Results:** Mean blood loss was significantly lower in the carbetocin group (331.3 mL) compared to the oxytocin group (411.5 mL) (p=0.035). Requirement of additional uterotonics was comparable between groups. No patient in the carbetocin group required blood transfusion, whereas 17.9% in the oxytocin group did. **Conclusion:** Carbetocin is more effective than oxytocin in reducing postpartum blood loss and may decrease the severity of hemorrhage, making it a reliable alternative for prevention of postpartum hemorrhage.

KEYWORDS

Carbetocin, Oxytocin, Postpartum Hemorrhage, Uterotonics, Randomized Controlled Trial

INTRODUCTION

Postpartum hemorrhage (PPH) remains one of the most significant complications in obstetric practice and a leading cause of maternal morbidity and mortality worldwide. Effective hemostasis after delivery depends on coordinated myometrial contraction during the third stage of labour, which compresses uterine blood vessels and limits blood loss; failure of this physiological mechanism results in excessive hemorrhage[1]. Clinically, PPH is classified into primary (within 24 hours of delivery) and secondary (after 24 hours up to 12 weeks), with uterine atony being the most common cause, followed by retained placental tissue and genital tract trauma[1]. Globally, PPH contributes substantially to maternal deaths, particularly in low- and middle-income countries where delays in recognition and limited healthcare resources exacerbate outcomes[2]. In India, hemorrhage remains a major contributor to maternal mortality, reflecting persistent challenges in timely intervention and effective management. The clinical consequences of PPH are severe, ranging from acute hypovolemic shock and organ dysfunction to long-term complications such as anemia and increased healthcare burden.

Active management of the third stage of labour using uterotonic agents is the cornerstone of prevention. Oxytocin is widely recommended as the first-line agent; however, its short half-life necessitates repeated administration or continuous infusion, which may limit its effectiveness in certain clinical settings[3]. Carbetocin, a long-acting synthetic analogue of oxytocin, has emerged as a promising alternative due to its prolonged uterotonic action following a single dose. Its efficacy in maintaining uterine tone and reducing blood loss has been demonstrated in cesarean deliveries, including high-risk and multiple pregnancies[4].

Randomized controlled trials in vaginal deliveries among high-risk women have also shown that carbetocin reduces the need for additional uterotonics compared to oxytocin[5]. Further studies have demonstrated its effectiveness in preventing severe postpartum hemorrhage following vaginal delivery[6]. Recent trials evaluating dosing strategies have reported comparable or improved outcomes with carbetocin, reinforcing its clinical utility[7]. Additionally, economic evaluations suggest that carbetocin may be cost-effective by reducing the need for further interventions[8]. Comparative studies in cesarean sections have similarly shown reduced blood loss and improved uterine tone with carbetocin[9].

Identification of risk factors such as anemia, high parity, and obstetric complications remains essential for targeted prevention strategies[10]. However, variations in study design, patient populations, and healthcare settings limit the applicability of existing evidence[11]. There remains a need for further evaluation of uterotonic agents in routine clinical practice to establish their effectiveness and safety across diverse populations[12]. Therefore, this study is undertaken to evaluate the role of carbetocin in the prevention of postpartum hemorrhage and to assess its effectiveness in improving maternal outcomes.

MATERIAL AND METHODS

Study Design: This was a prospective, randomized controlled trial comparing the effectiveness of carbetocin and oxytocin in preventing postpartum hemorrhage.

Study Setting: The study was conducted in the Department of Obstetrics and Gynaecology at Rohilkhand Medical College and Hospital, Bareilly, a tertiary care teaching hospital.

Study Duration: The study was carried out over one year from 1 August 2023 to 31 July 2024.

Study Population: Pregnant women aged 18–40 years admitted for vaginal delivery or cesarean section and meeting the eligibility criteria were included.

Sample Size: A total of 78 patients were included and equally divided into two groups:

- Group A (n=39): Carbetocin 100 µg IM
- Group B (n=39): Oxytocin 10 IU IM

Sample size was calculated using power and sample size software ($\alpha = 0.05$, power = 90%).

Sampling Technique & Randomization: Participants were allocated using simple random sampling by lottery method.

Inclusion Criteria

- Pregnant women aged ≥18 years and <40 years
- Undergoing vaginal delivery or cesarean section

Exclusion Criteria

- Coagulopathy
- Known drug hypersensitivity
- Liver or renal disease
- Placental abnormalities (placenta previa, accreta)
- Placental abruption

Data Collection and Monitoring:
Patients were monitored postpartum for blood loss, vital parameters, and clinical signs of PPH. Hypotension was defined as systolic BP <90 mmHg or >20% fall from baseline. Routine antenatal investigations were recorded.

Assessment of Blood Loss
Blood loss was assessed using visual estimation, gravimetric method, and calibrated collection systems, supported by clinical parameters and laboratory values (hemoglobin, hematocrit).

Outcome Measures
- Total postpartum blood loss
- Change in hemoglobin and hematocrit levels
- Requirement of additional uterotonics
- Need for blood transfusion
- Maternal vital parameters

Ethical Consideration: Institutional Ethics Committee approval was obtained, and informed written consent was taken from all participants.

Statistical Analysis:
Data were analyzed using SPSS version 23.0. Descriptive statistics were expressed as mean, standard deviation, frequency, and percentage. A p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Distribution of study subjects according to age

	Uterotonic agent		
Age	**Carbetocin**	**Oxytocin**	**Total**
20-25	16	11	27
25-30	11	9	20
30-35	8	15	23
35-40	4	4	8
Total	39	39	78

χ^2=3.26, p=0.354

Table 1 There was no statistically significant difference between groups (χ^2=3.26, p=0.354), indicating comparable baseline age distribution.

Table 2: Distribution of study subjects according to gravida

	Uterotonic agent		
Gravida	**Carbetocin**	**Oxytocin**	**Total**
Primigravida	18	12	30
Multigravida	21	27	48
Total	39	39	78

χ^2=1.95, p=0.163

Table 2 shows the distribution of participants according to gravida. There was no statistically significant difference between the two groups (χ^2=1.95, p=0.163), indicating comparable obstetric profiles.

Table 3: Distribution of study subjects according to mode of delivery

	Uterotonic agent		
Mode of delivery	**Carbetocin**	**Oxytocin**	**Total**
LSCS	11	31	42
Vaginal Delivery	28	8	36
Total	39	39	78

χ^2=20.6, p=<0.001

Table 3 shows the distribution of participants according to mode of delivery. Carbetocin was more frequently used in vaginal deliveries, whereas oxytocin was predominantly used in LSCS, with a statistically significant difference (χ^2=20.6, p<0.001).

Table 4: Descriptive statistics of blood loss (ml)

			95% Confidence Interval			
Parameters	**Uterotonic agent**	**Mean**	**Lower**	**Upper**	**SD**	**p value**
Blood loss (ml)	Carbetocin	331.3	276.9	385.7	167.92	0.035
(ml)	Oxytocin	411.5	358.8	464.3	162.81	

Table 4 presents the comparison of mean blood loss between the two groups. The carbetocin group showed lower mean blood loss (331.3 mL) compared to the oxytocin group (411.5 mL), with a statistically significant difference (p=0.035), indicating better efficacy of carbetocin in reducing postpartum blood loss.

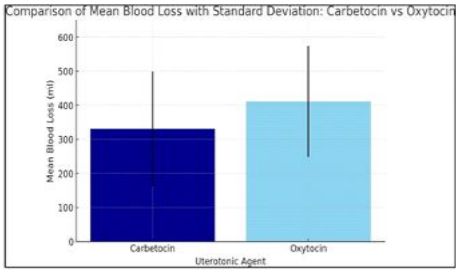


Figure 4: Descriptive statistics of Blood loss (ml)

Table 5: Distribution of study subjects according to need for other uterotonic drug

	Uterotonic agent		
Need for other uterotonic drug	**Carbetocin**	**Oxytocin**	**Total**
No	35	37	72
Yes (T. Misoprostol P/R)	4	2	6
Total	39	39	78

χ^2=0.722, p=0.395

Table 5 shows the requirement of additional uterotonic drugs. The majority of patients in both groups did not require further intervention. Although slightly more patients in the carbetocin group required additional uterotonics, the difference was not statistically significant (χ^2=0.722, p=0.395).

Figure 5: Distribution of study subjects according to need for other uterotonic drug

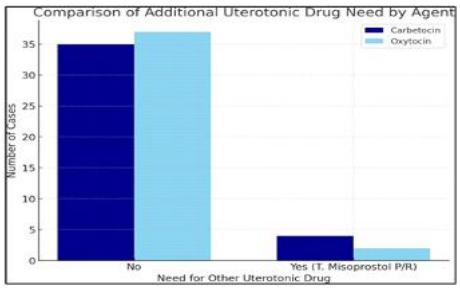


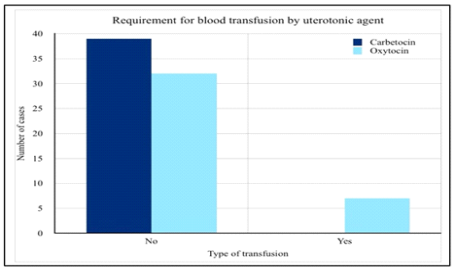
Table 6: Distribution of study subjects according to need for blood transfusion

	Uterotonic agent		
Need for blood transfusion	**Carbetocin**	**Oxytocin**	**Total**
No	39	32	71
Yes	0	7	7
Total	39	39	78

χ^2=7.69, p=0.104

Table 6 shows the distribution of patients according to the need for blood transfusion. None of the patients in the carbetocin group required transfusion, whereas 7 patients in the oxytocin group did. This indicates a lower transfusion requirement with carbetocin.

Figure 6: Distribution of study subjects according to need for blood transfusion



DISCUSSION

The majority of participants were aged 20–25 years (34.6%), followed by 30–35 years (29.5%), with no statistically significant difference between groups (χ^2=3.26, p=0.354), indicating comparable baseline characteristics. Similar distributions have been observed by Liu et al. (2020)[5] and Akter et al. (2021)[9], who reported no significant age-related differences between groups. Patil et al. (Year not specified)[12] also noted a predominance of younger reproductive age. Korb et al. (2023)[6] demonstrated comparable age profiles in a larger cohort. In contrast, Pubu et al. (2021)[10] identified age ≥35 years as a risk factor for postpartum hemorrhage, which was not reflected here.

Multigravida women constituted 61.5% of the population, with primigravida accounting for 38.5%, and no statistically significant difference between groups (χ^2=1.95, p=0.163), suggesting comparable obstetric profiles. Similar parity distributions were reported by Liu et al. (2020)[5] and Akter et al. (2021)[9], with no significant influence on outcomes. Korb et al. (2023)[6] also found no parity-based variation in results. Patil et al. (Year not specified)[12], conducted in primigravida women, highlighted parity relevance in uterine response. In contrast, Pubu et al. (2021)[10] reported higher parity as a risk factor for postpartum hemorrhage, which was not evident here.

A statistically significant difference in mode of delivery was observed (χ^2=20.6, p<0.001), with LSCS accounting for 53.8% and vaginal delivery 46.2%. Oxytocin was predominantly used in cesarean deliveries, while carbetocin was more frequent in vaginal births. Similar findings on delivery-related risk have been reported by Sotillo et al. (2020)[4] and El-Nasr et al. (2024)[11], where cesarean delivery was associated with higher blood loss. Akter et al. (2021)[9] also focused on cesarean cases with comparable outcomes. Korb et al. (2023)[6] demonstrated improved outcomes with carbetocin in vaginal deliveries. Pubu et al. (2021)[10] identified cesarean section as a significant risk factor, supporting the observed distribution.

Mean blood loss was lower in the carbetocin group (331.3 ± 167.92 mL; 95% CI: 276.9–385.7) compared to the oxytocin group (411.5 ± 162.81 mL; 95% CI: 358.8–464.3), with a statistically significant difference (p=0.035), indicating better efficacy of carbetocin in reducing postpartum blood loss. Similar findings were reported by Balogun et al. (2024)[7], where oxytocin was associated with higher average blood loss, and Patil et al.[12], who observed significantly lower mean blood loss with carbetocin along with absence of PPH compared to 7% incidence in the oxytocin group. El-Nasr et al. (2024)[11] and Sotillo et al. (2020)[4] also demonstrated higher blood loss and greater hemoglobin drop with oxytocin. In contrast, Liu et al. (2020)[5] and Akter et al. (2021)[9] found no statistically significant difference in blood loss between groups, although both reported marginally lower values with carbetocin.

The requirement of additional uterotonic drugs was low in both groups, with 4 patients (10.3%) in the carbetocin group and 2 patients (5.1%) in the oxytocin group, and no statistically significant difference observed (χ^2=0.722, p=0.395). Similar findings were noted by Liu et al. (2020)[5] and Akter et al. (2021)[9], who reported comparable need for additional uterotonics between groups. Korb et al. (2023)[6] also observed similar intervention rates in preventing severe PPH. However, Balogun et al. (2024)[7] and El-Nasr et al. (2024)[11] reported higher additional uterotonic requirements with oxytocin, while Al Zubaidi and Alhaidari (2022)[3] demonstrated a significantly reduced need with carbetocin (risk ratio 0.36), indicating better uterine tone maintenance in those settings.

No patients in the carbetocin group required blood transfusion, whereas 7 patients (17.9%) in the oxytocin group required transfusion, suggesting a clinically lower transfusion requirement with carbetocin, although the difference was not statistically significant (χ^2=7.69, p=0.104). Similar trends were reported by El-Nasr et al. (2024)[11] and Sotillo et al. (2020)[4], where higher transfusion rates were observed with oxytocin. Balogun et al. (2024)[7] also noted increased intervention requirements with oxytocin, while Patil et al.[12] reported no transfusion requirement in the carbetocin group. In contrast, Liu et al. (2020)[5] and Akter et al. (2021)[9] found no significant difference in transfusion rates, indicating comparable outcomes in certain populations.

CONCLUSION

Carbetocin demonstrated superior efficacy in reducing postpartum blood loss compared to oxytocin, as evidenced by a statistically significant lower mean blood loss and narrower confidence interval. While the requirement for additional uterotonics did not differ significantly between groups, the need for blood transfusion was observed only in the oxytocin group, indicating a clinically meaningful reduction in severity of hemorrhage with carbetocin. Baseline comparability in age and gravida distribution ensured that the outcomes were not influenced by demographic or obstetric confounders. Although a significant difference in mode of delivery was noted, the overall findings consistently favored carbetocin in terms of hemorrhage control. The prolonged uterotonic action of carbetocin likely contributed to improved uterine tone and reduced atony-related bleeding. These observations suggest that a single intramuscular dose of carbetocin is effective in preventing postpartum hemorrhage and may reduce the need for further interventions. Therefore, carbetocin can be considered a reliable alternative to oxytocin in routine obstetric practice for improving maternal outcomes.

REFERENCES

1. Wormer KC, Jamil RT, Bryant SB. Postpartum hemorrhage. InStatPearls [internet] 2024 Jul 19. StatPearls Publishing.
2. Aimagambetova G, Bapayeva G, Sakhipova G, Terzic M. Management of postpartum hemorrhage in low-and middle-income countries: emergency need for updated approach due to specific circumstances, resources, and availabilities. Journal of Clinical Medicine. 2024 Dec 4;13(23):7387.
3. Al Zubaidi S, Alhaidari T. Heat stable carbetocin vs. oxytocin for the prevention of post-partum hemorrhage in emergency caesarean delivery: a randomized controlled trial. Journal of Perinatal Medicine. 2022 Feb 23;50(2):150-6.
4. Sotillo L, De la Calle M, Magdaleno F, Bartha JL. Efficacy of carbetocin for preventing postpartum bleeding after cesarean section in twin pregnancy. The Journal of Maternal-Fetal & Neonatal Medicine. 2020 Jan 17;33(2):267-71.
5. Liu H, Xu XY, Gu N, Ye XD, Wang ZQ, Hu YL, Dai YM. Intravenous administration of carbetocin versus oxytocin for preventing postpartum hemorrhage after vaginal delivery in high risk women: a double-blind, randomized controlled trial. Maternal-Fetal Medicine. 2020 Apr 1;2(02):72-9.
6. Korb D, Lopez R, Hörlin AL, Schmitz T, Borie C, Sibony O. Effectiveness of prophylactic carbetocin versus oxytocin following vaginal delivery for preventing severe postpartum hemorrhage. International Journal of Gynecology & Obstetrics. 2023 Sep;162(3):889-94.
7. Balogun RO, Lawal OO, Bello YO, Ododele TM, Morhason-Bello IO, Oladokun A. A randomized controlled trial on the comparison of two doses of carbetocin with oxytocin for the prevention of postpartum hemorrhage (concert trial). Journal of Obstetrics and Gynaecology Research. 2024 Nov;50(11):2046-56.
8. Matthijsse S, Andersson FL, Gargano M, Yip Sonderegger YL. Cost-effectiveness analysis of carbetocin versus oxytocin for the prevention of postpartum hemorrhage following vaginal birth in the United Kingdom. Journal of Medical Economics. 2022 Dec 31;25(1):129-37.
9. Akter N, Jesmin S, Shamima MN, Zahan N, Naznin F, Sharmin S. Comparative Study between Oxytocin and Carbetocin for the prevention of Primary Postpartum Hemorrhage following Caesarean Section. Ibrahim Cardiac Medical Journal. 2021;11(1):71-8.
10. Pubu ZM, Bianba ZM, Yang G, CyRen LM, Pubu DJ, Lang KZ, Zhen B, Zhaxi QZ, Nyma ZG. Factors affecting the risk of postpartum hemorrhage in pregnant women in Tibet health facilities. Medical science monitor: international medical journal of experimental and clinical research. 2021 Feb 13;27:e928568-1.
11. El-Nasr IA, Mahmoud SA, Elhalby AE, Abdelwahab MA. Comparative Clinical Study for Uterotonic Drugs Used in Reducing Postpartum Haemorrhage for Risky Patients in Caesarean Section. Egyptian Journal of Hospital Medicine. 2024 Oct 3;96(1):2597-602.
12. Patil A, Puram M, Thobbi VA. Carbetocin versus oxytocin in primigravida for active management of third stage of labor: a prospective study.