

EFFECTIVENESS OF CARBETOCIN VERSUS OXYTOCIN FOR HEAMODYNAMIC SATBILITY AFTER SPINAL ANESTHESIA IN C/S DELIVERIES: A MULTICENTER COHORT STUDY IN ADDIS ABABA, ETHIOPIA, (2025).

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Abstract

Background: Because of its safety margin, spinal anesthetic block is the most commonly used anesthesia procedure for cesarean delivery and during cesarean delivery, uterotonic drugs are routinely recommended after the delivery of the baby to prevent postpartum hemorrhage. Investigations assessing the contractile properties of oxytocin and carbetocin reported comparable adverse reactions for the two agents. Analyzing the hemodynamic side effects of these medicines appears essential and urgent considering their role as prophylactic medication and a rising percentage of high-risk parturient.

Objective: To compare effectiveness of carbetocin versus oxytocin for hemodynamic stability after spinal anesthesia in C/S delivery in a private and tertiary public hospital, a prospective cohort study, Addis Ababa Ethiopia, from February 1- April 30/2025.

Method: A multi-center cohort study had been conducted among 66 parturients who undergone elective cesarean section under spinal anesthesia. The Collected data was statistically analyzed with SPSS version 26. Demographic and clinical data was computed with independent sample t-test and categorical data was measured using chi square test and for qualitative variables fisher's exact test is employed, when applying the condition for chi square test were not fulfilled. Additionally, non-parametric variables were computed using Mann Whitney U test. A P value of < 0.05 was deemed statistically significant.

Result: There was statistically significant difference in terms of hemodynamic parameters 1 minute after administration of the study medication the decrease in BP was (p- value Of 0.02 in SBP, 0.27 in DBP and 0.003 in MAP). Incidence of hypotension occurred in 12(36.4%) parturients in oxytocin group and 11(33.3%) parturients in a carbetocin group with p- value of 0.796 which is not statistically significant. There was no significant difference in terms of Vasopressor requirement, amount of blood loss and requirement for additional uterotonic agent among the groups with a p- value of 0.301, 0.285 and 0.286 respectively.

Conclusion and recommendation: The change hemodynamic profile was better maintained in the carbetocin group. In the availability of both medications, we recommend to preferably use carbetocin than oxytocin, because of higher incidence of chest pain with the use of oxytocin and better hemodynamic profile in the carbetocin.

Key words: Oxytocin, Carbetocin, Hemodynamic stability, Spinal anesthesia

Introduction

Caesarean section is advised when vaginal delivery poses a risk to the mother or child. The process indicator, urgency, partial desire, and skills of the anesthesiologist and surgeon are all factors that influence the selection of anesthesia for Caesarean delivery.(1) Because of its safety margin, spinal anesthetic block is the most commonly used anesthesia procedure.(2)

During cesarean delivery, uterotonic drugs are routinely recommended after the delivery of the baby to prevent postpartum hemorrhage.(3) There are many pharmacological options for the management of postpartum hemorrhage, oxytocin being the first line of treatment.(4)

The first-line uterotonic drugs are oxytocin and its analogue, carbetocin.(3) The World Health Organization recommendations for PPH treatment and prevention also advise the use of 10 units of oxytocin (intramuscularly or intravenously) for the prevention of PPH in all births. This injection is often followed by a maintenance dose of 10 IU over several hours because the half-life of oxytocin is 4 to 10 minutes.(5)

Prophylactic administration of carbetocin may be a good alternative to oxytocin to prevent postpartum haemorrhage as suggested by several litterateurs.(6) Carbetocin has similar affinity for oxytocin receptors as the oxytocin but with a longer half- life.(3)

The oxytocin receptor, which is expressed in the uterus around the later stages of pregnancy and also exists in the cardiovascular system and modulates hemodynamic processes, is affected by both oxytocin and carbetocin. Consequently, the two medications have hemodynamic effects, comprising bradycardia, tachycardia, hypertension, and hypotension.(9) Both drugs can cause peripheral vasodilation and hypotension in addition to increased cardiac output mediated by an increase in heart rate and stroke volume.(3)

Investigations assessing the contractile properties of oxytocin and carbetocin reported comparable adverse reactions for the two agents. Analyzing the hemodynamic side effects of these medicines appears essential and urgent considering their role as prophylactic medication and a rising percentage of high-risk parturient, either due to pre-existing cardiovascular disorders or complications linked to pregnancy.⁷

One known side effect of the subarachnoid block that can compromise both the health of the mother and the fetus is maternal hypotension. Occasionally, it can also result in Cardiac arrest, a dangerous consequence that can cause an enormous range of death and morbidity.(10)

In 2019, according to a study done in Addis Ababa, Ethiopia, 64% of parturients suffer from hypotension following spinal anesthesia.(11) A prospective study conducted in Sweden reported spinal anesthesia and oxytocin induced arterial dilation and heart affection. Despite a drop in blood pressure, oxytocin reduced heart rate, demonstrating a direct negative chronotropic effect.(12)

From our experience, oxytocin is the most widely used uterotonic agent for AMTSL in Ethiopia. After administration of this medication a most of the parturients complain chest pain, the hypotensive effect of spinal anesthesia will be exacerbated and they will experience an episode of a transient increment followed by a decrease in heart rate. When it comes to parturients who have underlying cardiovascular disease, this could compromise the mother's health and be a serious problem.

During a cesarean section, after administration of Oxytocin, a lot of women feel uneasy, nauseous, and have chest pain. Significant circulatory dose dependent effects of oxytocin have been linked to these symptoms. Which include, ECG ST- depression, increase in heart rate (HR), stroke volume, and cardiac output (CO), as well as decreases in arterial blood pressure (BP) and systemic vascular resistance.(13)

Hypotension, tachycardia, nausea, an ST- segment change on electrocardiogram (ECG), or cardiac arrest are just a few of the negative symptoms that can result from an excess of oxytocin.(14)

Reaching a general conclusion on hemodynamic effect of the two medications will be difficult due to lack of previous study in our country and the controversy regarding studies conducted in other countries. This calls for further research in this area. It is an urgent issue given their significance as a preventive medication and rising number of high-risk parturients, either as a result of previous cardiovascular disorders or pregnancy- related complications.

This prospective cohort study is a multi-center, hospital-based study aimed at comparing the haemodynamic effect of carbetocin and oxytocin inpatients undergoing cesarean section delivery under spinal anesthesia.

The prevention and management of hemodynamic instability after spinal anesthesia administration and as a result of uterotonic agent administration is one of the main responsibilities of the anesthesia professionals. As a responsible professional, investigating the hemodynamic effect of carbetocin versus oxytocin via research will provide evidence based safe utilization of uterotonic agent with a better hemodynamic effect.

The results of this investigation will be useful in determining which uterotonic drug will be advantageous in resolving issues regarding haemodynamic instabilities in our nation's configuration and it will serve as a starting point for other studies as well as evidence for learning purpose.

General objective

To compare the effect of carbetocin versus oxytocin on hemodynamic stability following spinal anesthesia during cesarean section deliveries in multi-center hospitals in Addis Ababa, Ethiopia, from February 1 to April 30,2025.

Specific objective

To compare the hemodynamic effect of oxytocin and carbetocin among mothers who deliver through C/S after spinal anesthesia administration in Addis Ababa private and tertiary public hospitals.

To compare vasopressor requirement after administration of oxytocin and carbetocin among mothers who undergone C/S delivery after spinal anesthesia in Addis Ababa private and tertiary public hospitals.

Methods and materials

The study was carried out at Addis Ababa which is the capital city of Ethiopia. Furthermore, It's a highly developed and significant administrative, financial, and cultural hub for Ethiopia. It regarded as one of the Africa's principal capitals. The history of Addis Ababa's founding begins in the late 19th century, when Menelik II Negus of Shewa established mount Entoto in 1886.

St, Paul's Hospital had been constructed by Emperor Haile Selassie together with the German Evangelical church in 1969(known as St. Paul general Specialized Hospital until 2008) to provide healthcare for underprivileged communities. Established to meet the nation's growing demand for skilled medical professionals and advanced healthcare, St. PHMMC has consistently expanded the possibilities within Ethiopia's healthcare and education sectors by: providing comprehensive, high-quality care to over 2000 patients each day.

Lancet general hospital is a private hospital which was founded in November 2020 and it has an MCH center located in Addis Ababa, Ethiopia. A group of 24 specialists and sub-specialists in field of medicine, surgery, pediatrics, histopathology, radiology, critical care and anesthesiology formed Lancet.

Study Design and Period

A prospective cohort study was conducted in one selected private hospital and one tertiary public hospital in, Addis Ababa Ethiopia, from February 1- April 30/2025.

All mothers who undergone elective C/S delivery using spinal anesthesia and who took either oxytocin or carbetocin for management of third stage of labor in selected hospitals, Addis Ababa.

Study Population

Elective C/S delivered mothers who took spinal anesthesia and either oxytocin or carbetocin for management of third stage of labor in selected hospitals, in Addis Ababa, during the study period and those who fulfilled inclusion criteria.

Sample Size

To calculate the sample size, for comparison of the two population, the mean value of mean HR $\pm$ standard deviation is used from the previous research done in Egypt.(7). The mean value of mean HR immediately after drug administration of oxytocin and carbetocin (mean $\pm$ SD) was 16.32 ± 2.51 bpm and 14.51 ± 2.43 bpm for patients who took oxytocin and carbetocin respectively from the above research with 80% power and 95% CI. Taking this in to consideration the sample size with 15% contingency will become, a total of 66 sample size with 33 in each group.

Sampling technique and procedure

The participants of the study were chosen using systematic random sampling technique. The k value ($k=N/n$, $675/66=10$.) was determined with systematic random sampling, where N is the number of c/s delivery mothers with in last three-month, n is the sample size, and k is the interval. One of the first 10 mothers was selected to be a study participant.

A situational analysis was performed in each hospital based on recorded logbook of elective c/s deliveries for the previous three months during the same time period. 367 cases are done in St. PHMMC and 300 cases in Lancet MCH center.

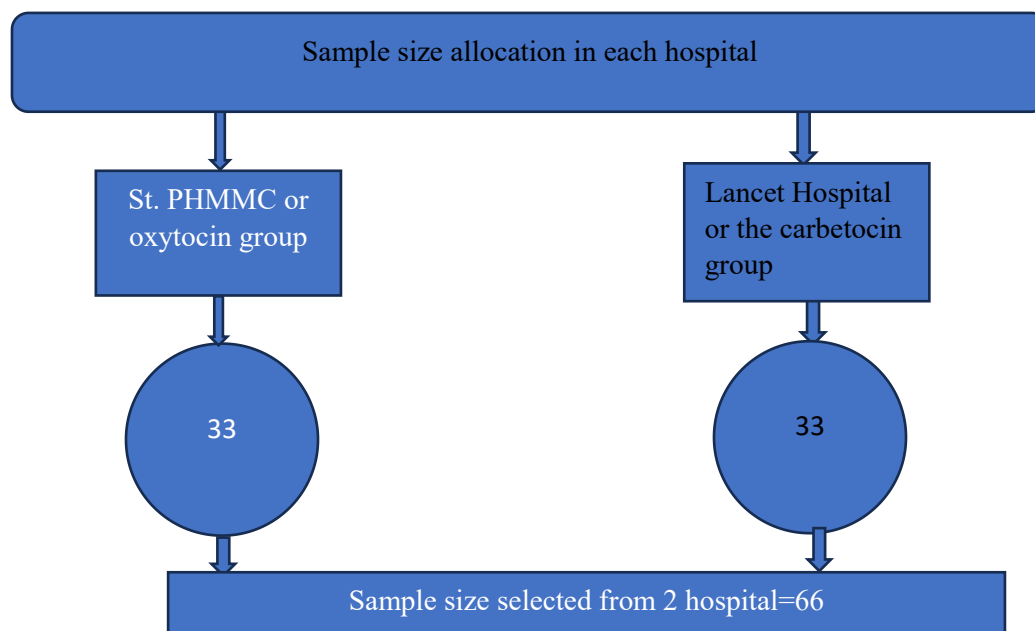


Figure 1: Proportional sample size allocation

Dependent variable

1. Hemodynamic changes
2. Vasopressor requirement

Independent variables

1. Patient related factor

Demographic data of the mother (age, weight, height, BMI)

Indication for C/S and

Amount of preload

1. Surgery related factors

Number of c/s scar

Amount of surgical blood loss

2. Use of uterotonic agents

Oxytocin

Carbitocin

3. Anesthesia related factors

Dose of local anesthetic agent.

Dose of additive and

Intraoperative fluid intake

Inclusion Criteria were: The study had included a healthy pregnant women, who were ASA class II undergoing elective C/S at term with spinal anesthesia and active.(16)

Exclusion Criteria were: women with placenta previa, women taking anticoagulant medication, placental abruption, and multiple gestation were excluded since their condition was linked to increased incidence of PPH. Additionally, women with pregnancy related complications, preeclamptic mothers, women with gestational diabetes, women with preexisting conditions such as insulin-dependent diabetes, cardiovascular or renal disease, or women with hypo- or hyperthyroidism were also excluded because they may have impact on hemodynamic parameters. Furthermore, eliminated were women who was taking medications known to have effect on cardiovascular and renal disease system.(7) Ultimately, Parturient who got re-spinal anesthesia for failed spinal anesthesia were excluded.

Data collection procedure

Primary and secondary data was collected through structured questionnaire. Questionnaires were prepared in English. In order to obtain relevant and quality data, data collectors had been trained about what he/she had conducted clearly at first. The data collectors were 2 trained anesthetists from the 2 selected hospitals. Instruments for data collection procedure mainly was noninvasive monitor with: - (NIBP monitor, ECG, pulse oximetry), and uterotonic agents, meter and weight measuring device to asses BMI of the patient to measure the data needed for structured questioners. And secondary data were collected from patient charts

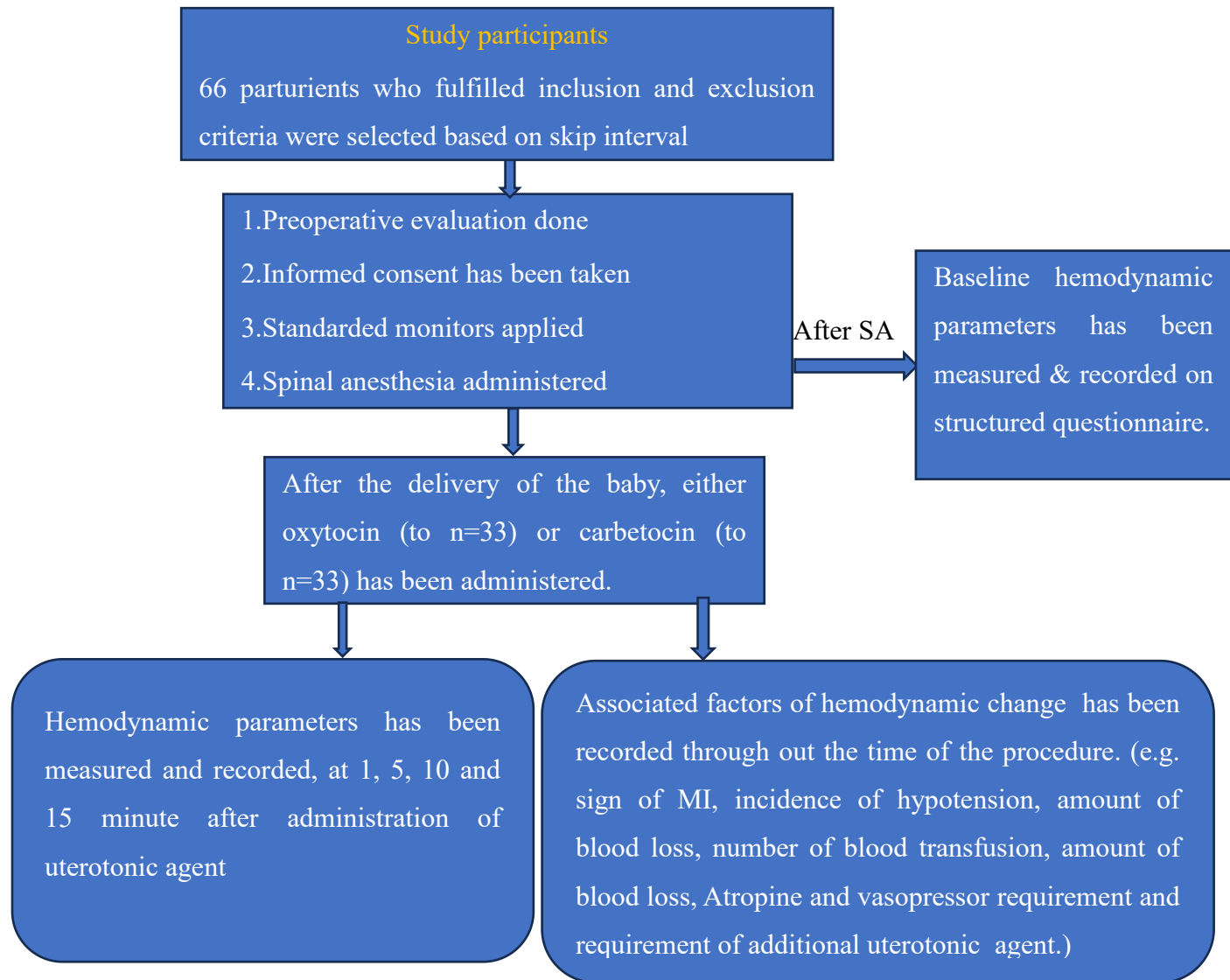


Figure 2: Data collection procedure from Feb 1- April 30, 2025, at St. PHMMC and Lancet MCH center

Operational definitions

1. **Hemodynamic parameters:** it is about the metrics used to quantify the factors that influence blood flow and pressure within the cardiovascular system. These parameters help to assess the bodies' ability to deliver oxygen and nutrients to the tissues. In this study it is about BP (SBP, DBP and MAP), HR and SPO2.
2. **Hypotension:** was defined as a decrease in MAP greater than 25% of the baseline.(23)

3. **Symptoms of myocardial ischemia:** (e.g., chest pain, shortness of breath, and or feeling of heaviness in chest pain.
4. **Uterotonic agent:** a medication used to stimulate uterine muscle contraction.
5. **Spinal anesthesia:** is a type of regional anesthesia where a local anesthetic agent is administered in to subarachnoid space and cause a temporary loss of sensation and numbness to the lower part of the body.
6. **Caesarean section:** a surgical incision made on the mother's lower abdomen followed by uterine incision for the baby under anesthesia.
7. **Parturient:** a pregnant woman about to give birth.
8. **ASA:** American society of anesthesiologist physical status classification system.
9. **Vasopressor:** a medication used to rise BP by constricting blood vessels.

Data analysis process and interpretation

Data was collected, and statistically analyzed with Statistical package for social science SPSS version 26. Demographic and clinical data was computed with independent sample t-test, chi square test to measure categorical data and fisher's exact test for qualitative variables when applying the condition for chi square test were not be met And Mann Whitney U test was used to compare non parametric variables. A P value < 0.05 was considered statistically significant.

Data quality control

In order to ensure the quality of the data the data collectors were well trained and be informed about the objective and the aim of the research as well as they took orientation about the assessment tool. A pretest was conducted within 10% of total sample size in order to evaluate the quality of assessment tool at TASH and Betsega hospital. During data collection procedure the investigator checked the completeness of the data. Data cross checking was performed before data analysis process.

Ethical consideration

Ethical clearance was obtained from Addis Ababa university institutional review board. After ethical approval, to get a permission each hospital had been consulted prior to data collection process. And finally, a written informed consent was obtained from all participants. The written

consent states about the objective of the study, the confidentiality and privacy of the study participants was ensured and those who were willing to participate was included.

Dissemination of the result

The final research will be sent to Addis Ababa university collage of health science school of medicine, department of anesthesia. One copy will be sent to involved institutions in the study and concerned bodies. Finally, the manuscript will be published on a reputable journal.

Result

Socio-Demographic characteristics, pre and intraoperative condition of the participants

The study included 66 parturients, with a response rate of 100%. There was no statistically significant difference among the groups except for hemoglobin count, others in terms of Age, height, weight, BMI, number of previous c/s scar, preoperative platelet count, amount of preload, dose of bupivacaine, dose of fentanyl and intraoperative fluid intake were comparable among the groups as shown in table 1.

Table 1: Descriptive analysis in regards of Socio-Demographic characteristics, pre and intraoperative condition of parturients undergoing elective C/S under SA at St. PHMMC and Lancet MCH center, Addis Ababa, Ethiopia 2025.

Preop parameters	Oxytocin group	Carbitocin group	P- value
Weight	73.9 ± 10.6	78.9 ± 14.1	0.108
BMI	27.3 ± 4.2	29.4 ± 4.9	0.063
Preop PLT count	176,060.6 ± 49,187.3	189,545 ± 46,758.1	0.827
Age	32(4.5)	33(5)	0.85
Hight	164(9.5)	165(7.5)	0.152
Number of c/s scar	2(1)	2(2)	0.833
Pre-op Hgb	13(1.4)	12.8(1.4)	0.009
Amount of preload	500(0)	500(0)	0.395
Dose of Bupivacaine	10(0)	10(0)	0.395
Dose of Fentanyl	25(0)	25(0)	0.138
Intra-op fluid intake	1800(500)	1850(450)	0.419

Hint: *= Pre-op= Preoperative, SD = standard deviation; Value is presented as: Mean and SD: Independent t test for normally distributed, and Mann-Whitney Test for non-normally distributed variables were used and data are presented as Median (IQR= Inter-quartile range), and p<0.05 is statistically significant.

Comparison of pre and intraoperative condition of the parturient

By using independent t test and Mann- whitney u test, the result stated as there is no significant difference in the base line hemodynamic parameters (SBP, DBP, MAP and PR) with a P- value= 0.108, 0.179, 0.867 and 0.199 respectively.

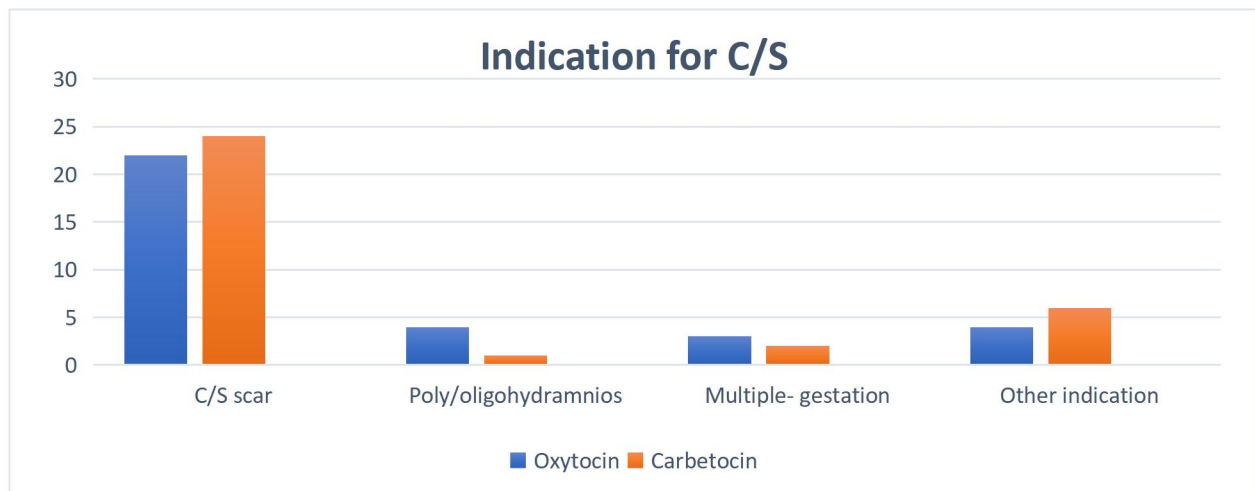


Figure 3: A column graph shows indication for C/S scar of parturients undergoing elective C/S under SA at St. PHMMC and Lancet MCH center Addis Ababa, Ethiopia, 2025.

From Fischer's exact test, the test revealed as there is no statistically significant difference among the groups in terms of indication for C/S with a p- vale of 0.483.

At the beginning parturients in the Oxytocin group took 20 Iu oxytocin in 1000 ml N/S infusion, and in the carbetocin group they took 100 mcg IV bolus.

Comparisons of hemodynamic parameters among groups

Change in vital sign among the groups

There was statistically significant difference ($p < .05$) among two groups when compared with systolic blood pressure, diastolic blood pressure except at 10 minutes, mean arterial blood pressure and pulse rate. There was no statistically significant difference in oxygen saturation thought the study time, with p- value > 0.05 . This and p values of variables are situated in the following tables and figures as follows:

Table 3: Comparison of change in SBP, DBP, and SP02 between oxytocin and carbetocin group among parturients who undergone C/S under SA at St. PHMMC and Lancet MCH center, Addis Ababa, Ethiopia 2025.

SBP (mmHg)				DBP (mmHg)			SPO2 (%)		
Time	Oxytocin	Carbetocin	P-value	Oxytocin	Carbetocin	P-value	Oxytocin	Carbetocin	P-value
Baseline	110(20)	115(15)	0.108	62(16)	70(19)	0.179	96(3)	96(1)	0.723
1 min	100(17)	110(15)	0.001	55(16)	60(9)	0.027	95(2)	96(2)	0.222
5 min	95(10)	108(15)	0.000036	50(10.5)	60(12.5)	0.006	96(3)	96(2)	0.995
10 min	95(12.5)	104(10)	0.001	54(16.5)	56(9)	0.244	96(2.5)	96(2)	0.794
15 min	92(20)	110(12)	0.000302	54(21)	60(17)	0.06	95(2)	96(2)	0.337

Hint: Min= minute, Median (inter quartile range) form Mann- Whitney U test, and a p-value< 0.05 is statistically significant.

There is a statistically significant difference in terms of change in MAP of the parturient among the groups, with a p- value of 0.003, 0.000076, 0.001, 0.001 at 1, 5, 10 and 15 minutes after uterotonic agent administration respectively, as shown in the following line graph.

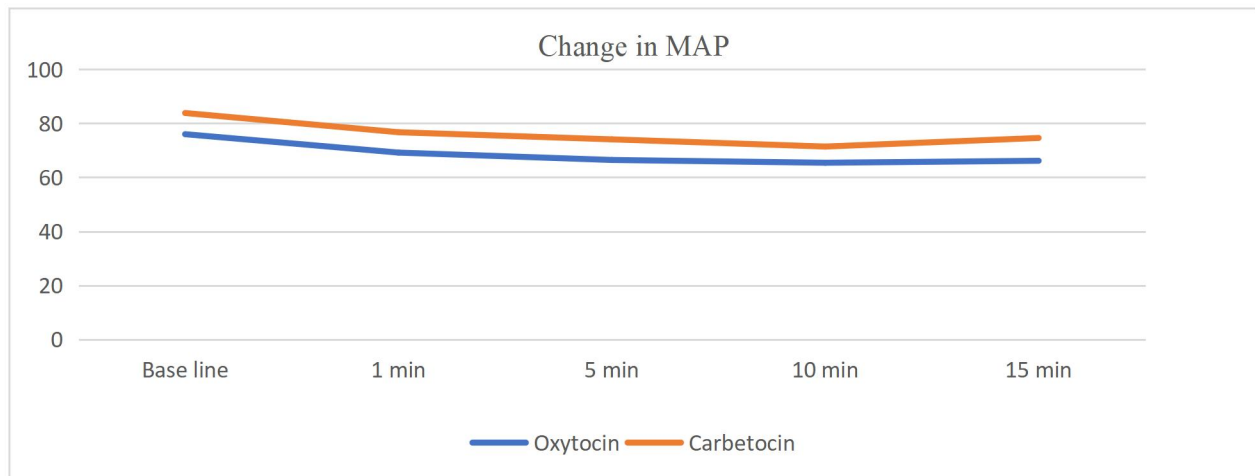


Figure 4: A line graph shows MAP (mmHg) at different time interval of parturients undergoing elective C/S under SA at St. PHMMC and Lancet MCH center Addis Ababa, Ethiopia, 2025.

The result of this study revealed as there is no statistically significant difference among the groups in terms of incidence of hypotension, number of parturient who require vasopressor and shortness of breath, with a P- value 0.796, 0.301 and 0.114 respectively, which is not statistically significant. On the other hand, there was a statistically significant difference in terms of one sign of MI (heavy feeling on the chest) among the groups with a P-value of 0.000004, as shown in the following column chart.

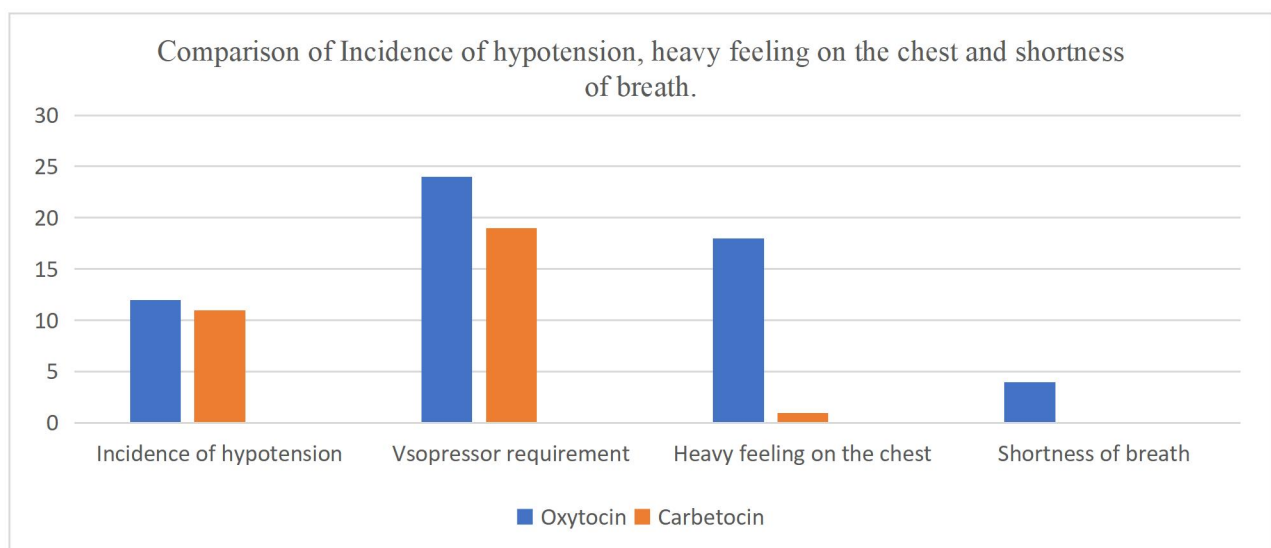


Figure 5: A column chart showing comparison of incidence of hypotension, vasopressor requirement, heavy feeling on the chest, and shortness of breath among parturients who

undergone elective C/S under SA at St. PHMMC and Lancet MCH center Addis Ababa, Ethiopia, 2025.

Table 4: Comparison of change in HR between oxytocin and carbetocin group among parturients who undergone C/S under SA at St. PHMMC and Lancet MCH center, Addis Ababa, Ethiopia 2025.

HR			
Time	Oxytocin	Carbetocin	P value
Base line	87.2±14.3	92±16	0.199
1 min	90(12.5)	94(12.5)	0.046
5 min	85(12.5)	95(10.5)	0.003
10 min	86.8±8.7	92±16	0.00001
15 min	86.9±8.1	95.8±9.7	0.000136

Hint: Mean ± standard deviation from independent t test and median (interquartile range) from Mann whitney u test

The data as shown beginning from 1 minute, there is a statistically significant difference among the groups with a P- value of < 0.05.

In this study as regards to heart rate, there was a rise in heart rate after administration of both drugs in both groups, by 7.58 ± 6.96 in oxytocin group and by 10.96 ± 9.32 in carbetocin group followed by a decrease in HR. There was no statistically significant difference in HR increment among the groups with a P- value of 0.121.

Comparison of other adverse effect among the groups

Amount of blood loss

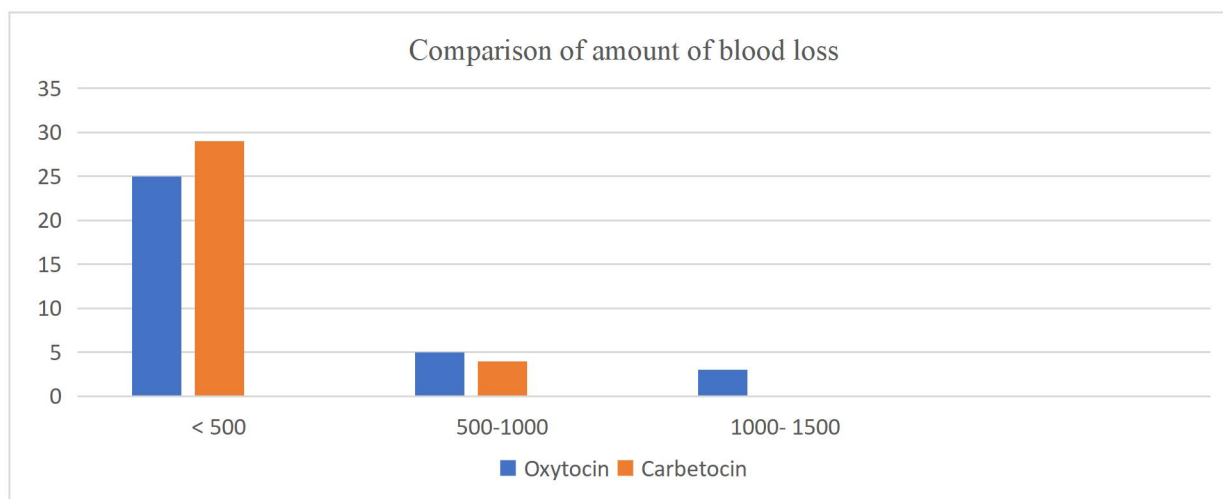


Figure 6: A column chart shows comparison of amount of blood loss among parturients who undergone elective C/S under SA at St. PHMMC and Lancet MCH center Addis Ababa, Ethiopia, 2025.

There is no statistically significant difference among the groups in terms of amount of blood loss with a P-value of 0.285, In addition blood loss of > 500 ml was smaller in carbetocin treated group than in oxytocin treated group. On the other hand, there was no blood transfused case in both groups.

Fischer's exact test has been used to determine the use of atropine among oxytocin and carbetocin group and the result has showed 2(6%) of parturients from the oxytocin group and none of parturients from the carbetocin group used atropine. The result was comparable among the groups with no statistically significant difference and p- value of 0.49.

Requirement for additional uterotonic agent

Requirement for additional uterotonic agent was analyzed by Fischer exact test and the result stated as there was no statistically significant difference in terms of need for additional uterotonic agent with a P- value of 0.182.

Vasopressor requirement

Dose of vasopressor requirement in oxytocin group (median=20, N= 33) and carbetocin group (median= 8, N= 33), U= 128, Z= -2.463, P= 0.014 and r= 0.305. Hence, there is a significant difference in the amount of vasopressor used among the groups. But there was no significant difference in number of parturient who require vasopressor among the groups as shown in figure 5.

Discussion

The findings of this study revealed that as there is a statistically significant difference in the haemodynamic parameters (change in vital signs), except for oxygen saturation.

In our study, incidence of hypotension occurred in 12(36.4%) parturients in oxytocin group and 11(33.3%) parturients in a carbetocin group, which is not statistically significant (p-value of 0.796). On the other hand, a study conducted in Egypt by salah et al. Showed incidence of hypotension following the administration of oxytocin group was around 20 (50%) of patients and in carbetocin group was around 17 (42%) patients with no statistically significant difference (p-value of 0.453). (7) Compared to our study the occurrence is much higher in their study; this might be because they used much more concentrated form of oxytocin in their study. Additionally, the difference in demographic characteristics with our population might influenced it.

In this study the number of parturients who required vasopressor were 24 (73%) in oxytocin group and 19 (57.58%) in carbetocin group with no statistically significant difference and p-value was 0.301. However, a study conducted by salah et al. showed as, Ephedrine was used to treat hypotension in about 14 (35%) of parturient in oxytocin group and 15 (37.5%) of parturient in a carbetocin group (p-value= 0.347).(7) The difference might be related to, use of additional uterotonic agent in our study participants, while there was no need for additional uterotonic agent in their study participants.

This study showed that, no statistically significant difference in amount of blood loss and no blood transfusion were required in both groups. Near similarly, a study by salah et al. Showed no significant difference in amount of blood loss and no need for blood transfusion in both groups. This study is in contrary to the prospective case control study conducted in India which stated, a significant difference among oxytocin and carbetocin group, 81% experiencing <500 ml blood loss in carbetocin group and 54% in oxytocin group with p-value of < 0.001.(22) They have used nearly similar dose of oxytocin which was 10 IU in 500 ml normal saline and carbetocin 100 mcg IV. The difference might be due to; their study has been conducted among mothers with a high risk of PPH. In our study this kind of population were excluded.

In this study as regards to heart rate, there was a rise in the heart rate following administration of the both drugs in both groups, by 7.58 ± 6.96 in oxytocin group and by 10.96 ± 9.32 in a carbetocin group followed by a decrease in HR. The difference was not statistically significant among the groups with P- value of 0.121.

An RCT study conducted in Egypt found that parturients treated with both oxytocin and carbetocin showed a sharp rise in HR after administration of the study drug, reaching a peak of 16.32 ± 2.51 bpm and 14.51 ± 2.43 bpm respectively 1 minute later. The difference was not statistically significant with a p- value of 0.063. (7) Their finding was not consistent with our result. Possibly this might happen because they have used more concentrated oxytocin dose (5 IU in 10 ml N/S IV bolus) in oxytocin group, while in our study a more diluted form of oxytocin has been used (20 IU in 1000ml or 30 IU in 1000ml N/S IV infusion).

An oxytocin bolus's hemodynamic effect is illustrated by systemic vasodilation, which causes tachycardia, sever hypotension and an increase in cardiac output. Prior research has shown that these effects are dose dependently exhibited.(22)

In terms of the need for additional uterotonic agent an RCT study conducted by kalal et al. Showed that the requirement for additional uterotonic agent and amount of blood loss was comparable in both groups. According to their study 2 patients from both groups required additional uterotonic agent.(24) In our study, a total of 6 parturients from oxytocin group and 1 parturient from carbetocin group required additional uterotonic agent with no significant difference among the groups. The number is slightly higher in our oxytocin administered groups and these might be because of different dose of medication used and different demographic characteristics from our study population. In terms of amount of blood loss our result is consistent with the result of their study with no statistically significant.

The result of this study showed as, the incidence of chest pain/heavy feeling on the chest was higher oxytocin group, which occur in 18 (54%) and 1 (3%) of parturients in the carbetocin group with a P – value of 0.000004, which is statistically significant. On the contrary, an RCT conducted in Indea showed as none of parturients in carbetocin group and 3 (6%) of parturients in oxytocin group develop chest pain with a P – value of 0.079, which is not statistically significant.(21) The number is higher in our oxytocin group, the possible reason for this might be,

because in their study parturients who took additional uterotonic agent are excluded from their study, but in our case they were not excluded from our study.

Limitation of study

Lack of prior cohort study to compare the study's findings. The research does not include emergency C/S delivered parturients. And also, post operative hemodynamic parameters are not included in this study. Additionally, it does not include patients who took GA.

Strength of study

Most of different factors that can affect the hemodynamic parameters were similarly distributed. Compared to other studies, this study focused on the routinely used method of administering the two 2 medications in different hospitals of Ethiopia which makes the result of the study more helpful.

Conclusion

The hemodynamic parameters such as; BP (MAP, SBP and DBP) and PR were different in a statistically significant manner among the groups. In terms of incidence of hypotension there was no statistically significant difference among the oxytocin and carbetocin group. However, the incidence of hypotension was higher in Oxytocin group. In terms of Vasopressor and Atropine requirement, amount of blood loss, shortness of breath and requirement of additional uterotonic agent there was no statistically significant difference. In terms of symptom of MI (chest pain, heavy feeling on the chest) there was significant difference among the groups and the symptom was higher in oxytocin group. The present study revealed as carbetocin have a better hemodynamic stability compared to oxytocin in our setup.

Recommendation

In the availability of both medications based on the patient condition that allow the use of both medications, we recommend for all Anesthetists and Anesthesiologists to preferably use carbetocin than oxytocin for AMTSL, because of oxytocin's related higher incidence of chest pain/heavy feeling on the chest compared to carbetocin.

We also recommend further research that include use of beat-to-beat monitoring for better assessment of their hemodynamic profile, including emergency patients and assessment of hemodynamic status of patients in the post operative period.

List of abbreviations and acronym

AMTSL- Active management of third stage of labor

ASA- American society of Anesthesiologist

BMI- Body mass index

BP- Blood pressure

BPM- Beat per minute

CHF - Chronic heart failure

CKD - chronic kidney disease.

CI- Confidence interval.

CO - Cardiac output

C/S- Cesarean section.

DBP- Diastolic blood pressure

ECG- Electrocardiogram

GA - General anesthesia

GDM _ Gestational diabetes mellitus

Hgb_ Hemoglobin

HSC- Heat stable carbetocin

IV- Intravenous.

MAP- Mean arterial pressure

NIBP- Noninvasive blood pressure

OR- Operation room

PPH- Post partum hemorrhage

PR- Pulse rate

SBP- Systolic blood pressure

SD - Standard deviation

SPO2 - Spontaneous oxygen saturation

St, PHMMC- St, Paul's Hospital Millenium Medical College

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Reference

1. Shamlool MMS, Ismail MM, Elshaer KSA. Comparative Study between Setting Position Versus Left Lateral Position Effects During Spinal Anesthesia Block in Caesarean Section. *Egypt J Hosp Med*. 2019;75(2):2128–35.
2. Hunie M, Fenta E, Kibret S, Teshome D. The current practice of spinal anesthesia in anesthetists at a comprehensive specialized hospital: A single center observational study. *Local Reg Anesth*. 2021;14:51–6.
3. Refaat S, Amin S, Tarek H, El Regal EA, Eissa AA, Zayed M, et al. Comparative hemodynamic effects of carbetocin vs oxytocin in mothers with stenotic valvular heart disease undergoing cesarean delivery: a randomized controlled trial. *Anaesthesia, Pain Intensive Care*. 2024 Aug 1;28(4):681–6.
4. G-i ASA, G-ii ASA. Original Article Haemodynamic effects of intravenous bolus of

carbetocin and oxytocin on women undergoing caesarean section Introduction : Results : 2023;28(1):25–9.

5. Delorme P, Kayem G, Legardeur H, Roux-Dessarps LA, Girard G, Meunier G, et al. Carbetocin versus Oxytocin for the Prevention of Postpartum Hemorrhage in Cesarean Deliveries: A Retrospective Study of Two Consecutive Periods. *AJP Rep*. 2020;10(3):E241–6.
6. Barman RK, Talukdar TK, Kalita P, Das BP, Choudhury JK. To study the efficacy of a single bolus dose of carbetocin for prevention of postpartum haemorrhage in elective caesarean section under spinal anaesthesia: a randomized clinical trial. *New Indian J OBGYN*. 2023;9(2):209–15.
7. Bahr MH, Elgamel AF, Salah M, Ibrahim M. The Hemodynamic Effects of Oxytocin and Carbetocin during Cesarean Delivery under Regional Anesthesia : A Double-Blinded , Randomized Study. 2018;7(7):1530–6.
8. Laxmi A, Priya P, Ashajyothi B, Aparna M, Prakash K, Radha P. A COMPARATIVE STUDY OF CARBETOCIN WITH OXYTOCIN IN THE PREVENTION OF POSTPARTUM HEMORRHAGE IN CAESAREAN SECTION. *Int J Acad Med Pharm* [Internet]. Available from: www.academicmed.org
9. Stämpfli D, Dommrich R, Orbach-Zinger S, Burden AM, Heesen M. An explorative analysis of pharmacovigilance data of oxytocin and its analogue carbetocin, with a focus on haemodynamic adverse effects. *Int J Clin Pharm*. 2023 Aug 1;45(4):922–8.
10. Ahmed M, Hossain M, Hossain KS, Uddin MB, Ahmed F. Outcome of Oxytocin on Haemodynamic Change During Caesarean Section under Spinal Anaesthesia. *Integr J Med Sci*. 2022;9:1–4.
11. Shitemaw T, Jemal B, Mamo T, Akalu L. Incidence and associated factors for hypotension after spinal anesthesia during cesarean section at Gandhi Memorial Hospital Addis Ababa, Ethiopia. *PLoS One* [Internet]. 2020;15(8 August):1–11. Available from: <http://dx.doi.org/10.1371/journal.pone.0236755>

12. Rabow S, Olofsson P. Pulse wave analysis by digital photoplethysmography to record maternal hemodynamic effects of spinal anesthesia, delivery of the baby, and intravenous oxytocin during cesarean section. *J Matern Neonatal Med.* 2017;30(7):759–66.
13. Rabow S, Jonsson H, Bro E, Olofsson P. Cardiovascular effects of oxytocin and carbetocin at cesarean section. A prospective double-blind randomized study using noninvasive pulse wave analysis. *J Matern Neonatal Med [Internet].* 2023;36(1). Available from: <https://doi.org/10.1080/14767058.2023.2208252>
14. Nagai A, Shiko Y, Noguchi S, Ikeda Y, Kawasaki Y, Mazda Y. Protocolized oxytocin infusion for elective cesarean delivery: a retrospective before-and-after study. *J Anesth.* 2024 Aug 1;38(4):425–33.
15. Vercauteren M, Palit Ş, Soetens F, Jacquemyn Y, Alahuhta S. Anaesthesiological considerations on tocolytic and uterotonic therapy in obstetrics. *Acta Anaesthesiol Scand.* 2009;53(6):701–9.
16. Moertl MG, Friedrich S, Kraschl J, Wadsack C, Lang U, Schlembach D. Haemodynamic effects of carbetocin and oxytocin given as intravenous bolus on women undergoing caesarean delivery: A randomised trial. *BJOG An Int J Obstet Gynaecol.* 2011 Oct;118(11):1349–56.
17. Kwon K, Kim D, Jo H, Park JE, Kim KO. Hemodynamic effects of carbetocin administered as an intravenous bolus or infusion during cesarean delivery. *Anesth Pain Med.* 2020;15(2):167–72.
18. Bekkenes M, Jørgensen MM, Jacobsen AF, Fagerland MW, Rakstad-larsen H, Solberg OG, et al. A study protocol for the cardiac effects of a single dose of either oxytocin 2 . 5 IU or carbetocin 100 µg after caesarean delivery : a prospective randomized controlled multi-centre trial in Norway [version 2 ; peer review : 2 approved]. 2022;1–31.
19. Jannu V, Hanagandi MP, Kalal R, Sabari CGS. Comparison of Haemodynamic Effects of Intravenous Carbetocin and Oxytocin during Caesarean Section Under Subarchanoid Block. *J Obstet Anaesth Crit Care.* 2023 Jul;13(2):193–7.

20. Moghadam SHP, Pourparizi M, Mirzaei T, Ravari A, Mirzaeikhalilabadi S. Analgesic Effect of Preoperative Intravenous Administration of Paracetamol on Post-cesarean Pain: A Randomized Clinical Trial. *Anesthesiol Pain Med.* 2023;13(1).
21. Refaat S, Amin S, Tarek H, Abou E, Regal E, Eissa AA, et al. Comparative hemodynamic effects of carbetocin vs oxytocin in mothers with stenotic valvular heart disease undergoing cesarean delivery : a randomized controlled trial. 2024;28(August):681–6.
22. Goel V, Karya U, Rani A, Dayal M. Hemodynamic and Uterotonic Effects of Carbetocin Versus Oxytocin in a Cesarean Section With a High Risk of Postpartum Hemorrhage. 2025;17(5).
23. Violence GB, Health AR, Among O, With W, In D, Of A, et al. Addis ababa university college of health science school of public health. 2011;(May).
24. Jannu V, Hanagandi MP, Kalal R, Sabari CGS. Comparison of Haemodynamic Effects of Intravenous Carbetocin and Oxytocin during Caesarean Section Under Subarchanoid Block. *J Obstet Anaesth Crit Care.* 2023;13(2):193–7.