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ORIGINAL ARTICLE

Dexmedetomidine as an Adjuvant to Either Hyperbaric Prilocaine (2%) or Bupivacaine (0.5%) in Intrathecal Anesthesia for Elective Cesarean Section: A Comparative Study

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ABSTRACT

Background: Dexmedetomidine can help extend the pain-relieving effects of local anesthetics and reduce the need for opioids during spinal anesthesia in women having planned cesarean sections. In order to determine which combination of dexmedetomidine and hyperbaric prilocaine (2% or 0.5%) is more successful in delivering dependable spinal anesthesia and adequate post-surgery pain management for pregnant women having an elective caesarean section, this study attempted to compare both of them.

Methods: In a prospective, randomized, double-blind clinical trial, we assessed the efficacy of hyperbaric prilocaine (50 mg in 2.5 mL) versus bupivacaine (12.5 mg in 2.5 mL), both combined with 5 µg dexmedetomidine, for spinal anesthesia in 74 participants undergoing elective cesarean section. The primary outcome was postoperative pain intensity, assessed using the Visual Analog Scale (VAS). Secondary outcomes included the onset and duration of sensory and motor blockade, time to rescue analgesia, patient satisfaction, and the incidence of adverse events.

Results: Postoperative VAS scores were comparable between groups except at 4 and 8 hours post-procedure, where the prilocaine group demonstrated significantly higher VAS scores ($P < 0.001$). Significant variations were observed in the regression of motor and sensory block, independent ambulation, first rescue analgesia time, and total analgesia within the first 24 hours, as the bupivacaine group had longer durations and lower analgesic doses in all these parameters ($P < 0.05$). The bupivacaine group experienced a significantly higher incidence of hypotension, nausea, and vomiting. Paradoxically, despite these adverse events, patient satisfaction scores were significantly higher ($P=0.04$) in the bupivacaine group compared to the prilocaine group.

Conclusions: Hyperbaric prilocaine (2%) with dexmedetomidine was as effective and safe as hyperbaric bupivacaine (0.5%) with dexmedetomidine in achieving spinal anesthesia for elective cesarean sections, offering adequate postoperative analgesia and early ambulation. Prilocaine may offer a quicker profile with fewer side effects.

Keywords: Bupivacaine; Dexmedetomidine; Elective Cesarean Section; Hyperbaric Prilocaine; Intrathecal Anesthesia.

INTRODUCTION

In order to provide a safe and effective cesarean section, spinal (intrathecal) anesthetic has been the standard for the past many decades [1]. As a local anesthetic, prilocaine (2%) is useful because of its quick start and intermediate duration of action. It is a secondary amide analogue of lidocaine. It inhibits the conduction of nerve signals by obstructing sodium channels on the membranes of neurons [2]. Prilocaine has comparable therapeutic effects to lidocaine but less toxicity due to its faster metabolism. As a result of its lower toxicity,

prilocaine is recommended for intravenous regional anesthetic techniques [3].

While both hyperbaric bupivacaine and spinal anesthesia with hyperbaric prilocaine provide equivalent levels of surgical anesthesia and patient satisfaction, the latter has the advantages of a faster onset of motor block and better hemodynamic stability. Prilocaine is an attractive substitute for bupivacaine in caesarean sections because of its ability to facilitate quicker recovery [4, 5].

For procedures that last an intermediate to lengthy time, spinal anesthesia with 0.5 percent bupivacaine, a long-acting amide local anesthetic, is a typical choice. It normally takes 5-8 minutes for it to start working, and then the effects wear off after about 1.5-3 hours [6]. When it comes to spinal anesthesia during cesarean sections, bupivacaine is still the local anesthetic of choice because of how reliable and successful it is [7].

With the added benefit of little respiratory depression, dexmedetomidine is an α2-adrenoceptor agonist that is renowned for its sedative, anxiolytic, sympatholytic, and analgesic-sparing properties. The fact that patients are able to stay awake and cooperative while taking dexmedetomidine is one of its distinguishing features [8]. Dexmedetomidine adds more time to spinal analgesia without causing major negative effects when used for caesarean sections under spinal anesthesia [9]. Hyperbaric bupivacaine's analgesic efficacy is increased by approximately 31% when administered intrathecally.

So, we aimed in this research to compare dexmedetomidine as an adjuvant to either hyperbaric prilocaine (2%) or bupivacaine (0.5%) in achieving effective intrathecal anesthesia with adequate postoperative analgesia for pregnant females undergoing elective cesarean section.

METHODS

This prospective, double-blinded, randomized clinical study was conducted on 74 pregnant females scheduled for elective cesarean sections at Zagazig University Hospitals for six months from January 2024 to June 2024. Patients and outcome assessors were blinded to the study groups.

Ethical considerations

After institutional review board (IRB) approval (ZU-IRB#10964-13-8-2023), all participants were asked to sign an informed consent. Human subjects research adhered to the guidelines set in the Declaration of Helsinki, which is part of the World Medical Association's Code of Ethics.

Sample size

When patients' visual analogue scale (VAS) scores were greater than 3 when they were released from the post-anesthesia care unit (PACU), the presumption was made. Prilocaine had a rate of 24.2%, and bupivacaine had a rate of 6.1% [10]. It was determined that a sample size of 74 people would be necessary to achieve a statistical power of 80% and a confidence interval of 95%. Each group consisted of 37 people, and they were split evenly.

Inclusion criteria

The study included 74 pregnant females aged 21 to 40 years old with normal pregnancies (gestational age > 37 weeks, single fetus). Women who were scheduled for elective cesarean sections and had a body mass index (BMI) of less than 30 kg/m² with a normal weight gain expected for a full-term uncomplicated pregnancy of 11.5-16 kg were classified as Class II according to the American Society of Anesthesiologists (ASA). The operation was expected to last less than an hour.

Exclusion criteria

Pregnant females who refused to participate in the study or had known allergies to study drugs, cardiovascular, renal, or hepatic diseases, hypertension, diabetes, placental abnormalities, signs of fetal distress, or any contraindications to spinal anesthesia (such as infection at the site of injection, coagulopathy, or any other contraindications) were excluded from the study.

Preoperative Preparation

The day before surgery, all participants underwent a detailed history-taking, focusing particularly on specific medical conditions and any allergic reactions to drugs. Complete clinical examination and routine laboratory investigations were done. Laboratory investigations included a complete blood count (CBC), coagulation profile, liver function tests (LFT), kidney function tests (KFT), and randomized blood sugar. Informed written consent regarding the procedure was obtained from all participants. Every patient was given an extensive description of the operation, which included how to use the Visual Analogue Scale (VAS) [11], a pain scale from 0 (no pain) to 10 (the worst possible agony). For every patient, we took their baseline vitals, which included their heart rate (HR), mean arterial pressure (MAP), and oxygen saturation (SpO_2). The patients were instructed to fast for 8 hours before fatty meals, 6 hours before light meals, and 2 hours before clear fluids, according to the American Society of Obstetric Anesthesiologists 2016 recommendations for

obstetric anesthesia [11].

Intraoperative management

Randomization: Seventy-four participants were randomly allocated into two equal groups (37 cases each) using a computer-generated randomization technique. The Prilocaine Group (Group P) received spinal anesthesia with 2.5 ml (50 mg) of hyperbaric prilocaine (2%) combined with 5 µg of dexmedetomidine, while the Bupivacaine Group (Group B) received spinal anesthesia with 2.5 ml (12.5 mg) of hyperbaric bupivacaine (0.5%) combined with 5 µg of dexmedetomidine. The local anesthetics and the adjuvant were prepared according to group allocation by an anesthesia assistant who did not participate in further assessment. All medications used in the trials were colorless. Patients, anesthesiologists who performed the anesthesia, and outcome assessors were blinded to the study drug preparations. All cesarean sections were performed by the same obstetrician.

Technique: Preoperative monitoring of the vital signs of the patients, including MAP, HR, and SPO2, was done, and basal data was recorded. A minimum of an 18G intravenous line was established, and patients were preloaded with 15 ml/kg of Ringer's lactate solution. To make the patient as comfortable as possible, the surgery was usually done while they were sitting. The use of suitable antiseptics was accompanied by a stringent adherence to aseptic practice. A sterile zone surrounding the access site was maintained by draping the patient's back as part of the spinal kit setup. Using a paramedian technique, 1 milliliter of 1% lidocaine was injected into the skin at the L3/L4 or L4/L5 intervertebral region to create a wheal, and the patient was then given local anesthetic [12]. Using a 25G spinal needle, 50 mg hyperbaric prilocaine (2%) and 5 µg dexmedetomidine were injected intrathecally in Group P, while 12.5 mg hyperbaric bupivacaine (0.5%) and 5 µg dexmedetomidine were injected intrathecally in Group B.

Following this, each woman was placed in the supine position with her left uterus displaced, and a face mask was used to administer oxygen at a flow rate of 2-4 L/min. Immediately following the administration of the anesthetic medication, the patient's hemodynamics (HR, MAP) and SPO2 levels were recorded. Subsequently, these values were monitored every 5 minutes during the initial 20 minutes, then again at 35 and 50 minutes into the procedure.

A sensory block at the T4 dermatome, as shown by a 25-gauge needle pinprick test, was considered a successful outcome of spinal anesthesia. After the intrathecal administration of the local anesthetic, sensory levels were assessed every 2 minutes until the maximum sensory block was achieved. The time it took to reach the block and the dermatome level at the end were meticulously documented [13]. The Modified Bromage Scale was used to evaluate motor block, and a Grade 3 score was considered the onset [14].

If there was no sensory or motor block within 20 minutes of injecting spinal anesthetic, it was considered a failure. These individuals were not included in the study because they were given general anesthesia.

Postoperative management

For postoperative pain management, patients received 1 g of intravenous paracetamol every 6 hours (maximum 4 g per day) during the first 24 hours. The patients were then moved to the PACU for further observation once they had recovered. If postoperative pain exceeded a VAS score of 3, a 75 mg intramuscular dose of diclofenac sodium was administered as rescue analgesia, with a maximum daily dose of 150 mg.

Data Collection

Patients' characteristics data: including age, ASA physical status, and BMI**.**

Primary Outcomes: VAS was recorded at 1h, 2h, 4h, 8h, 12h, and 24h postoperatively.

Secondary Outcomes: The time it took to reach the target dermatome (T4), as measured by the pinprick test, was considered the onset of sensory block, while the time it took to attain a grade 3 Bromage score was considered the onset of motor block. Both blocks were administered via spinal injections of local anesthetics. The time it took for feeling to return at the S1 dermatome was considered the regression of sensory block, whereas the time it took for the Bromage score to return to 0 was considered the regression of motor block. The initial administration of rescue analgesia was noted from the time the surgery concluded until the patient initially sought it out (VAS $\geq$ 3), and the total quantity of rescue analgesia administered within the initial 24 hours was also recorded. Immediate post-anesthesia monitoring of vital signs (MAP, HR, and SpO_2) was followed by 5-minute intervals for the first 20 minutes, 35 and 50 minutes into the procedure, and then every hour thereafter. Complications or side effects (such as bradycardia, headache, hypotension, nausea, or vomiting), the amount of time it took for patients to walk

independently for the first time, and the level of satisfaction felt by both patients and surgeons were also measured. Finally, to assess infant health, Apgar scores were taken 1 and 5 minutes following delivery.

Statistical analysis

We used IBM's SPSS 26 (2019) for Windows to analyze the data. Depending on the data's applicability, the Chi-square test or Fisher's exact test were used to compare categorical variables, while the Chi-square trend test was employed to evaluate ordinal data. Parametric test assumptions were checked using the Shapiro-Wilk test. When it came to quantitative data, we utilized medians and quartile ranges for data that didn't follow a normal distribution, and means and standard deviations (SD) for data that did. When the data was normal, the independent sample t-test was used for group comparisons, and when it was not, the Mann-Whitney U test was used. P-values < 0.05 were considered statistically significant, whereas those ≤ 0.001 were considered statistically highly significant.

RESULTS

Eligibility for this study was determined for 85 pregnant women who were scheduled for elective cesarean sections under spinal anesthesia. Eleven participants were ruled out of the study because of issues with the placenta or symptoms of fetal distress. The study included 74 participants, randomly assigned to two equal groups of 37 each (Figure 1).

Both groups had similar patient characteristics at baseline and similar data from operations ($P > 0.05$) (Table 1). The bromage scores did not differ significantly between the two groups ($P > 0.05$) (Table 2).

A non-statistically significant difference was revealed between the two groups as regards intraoperative heart rate and oxygen saturation ($P > 0.05$). However, the prilocaine group had a statistically significant higher mean arterial pressure at 5, 10, 15, 20, 35, and 50 minutes intraoperatively compared to the bupivacaine group ($P < 0.05$) (Figure 2).

The VAS scores did not differ significantly between the two groups, except for when the prilocaine group had higher values at 4 and 8 hours ($P < 0.001$) (Table 3). Onset times for both sensory and motor block were comparable between the two groups (Table 4). When comparing the two groups within the first 24 hours after surgery, the bupivacaine group demonstrated significantly longer periods of sensory and motor block, independent ambulation, and time to first rescue analgesia, along with lower total consumption of rescue analgesia ($P < 0.05$ for all comparisons) (Table 4).

The bupivacaine group had far better patient satisfaction (81.1%) than the prilocaine group (59.5%, $P = 0.04$), while the two groups' levels of satisfaction with the surgeon were similar ($P = 0.1$). No adverse effects were reported by 70.3% of patients in the prilocaine group compared to 24.3% in the bupivacaine group ($P = 0.04$). Bradycardia, hypotension, nausea, and vomiting were more common in the bupivacaine group ($P < 0.05$). When comparing the groups based on the Apgar score, which reflects the newborn's outcome, no significant difference was demonstrated ($P > 0.05$) (Table 5).

Table (1): Patients and intraoperative block characteristics among the studied groups

Variables	Prilocaine group (n=37)	Bupivacaine group (n=37)	Test value	P-value
Age (years) • **Mean ± SD** • **Range**	29.5±5.1 (21 – 39)	28.5±5.01 (22 – 39)	608 [a]	0.41
BMI (kg/m^2) • **Mean ± SD** • **Range**	25.6±3.05 (19 – 29.5)	25.6±2.62 (19.5 – 29)	667 [a]	0.85
Operation time (minutes) • **Mean ± SD** • **Range**	46.1±7.21 (35 – 59)	45±6.39 (37 – 58)	631 [a]	0.57

	N (%)	N (%)		
ASA physical status • I • II	0 (0%) 37 (100%)	0 (0%) 37 (100%)	F [b]	1.00

[a] *Mann-Whitney U test.*
[b] *Fisher's exact test.*
P ≥ 0.05 was considered statistically non-significant.
ASA, American society of anesthesiologists; BMI, Body mass index.

Table (2): Comparison of Bromage score among the studied groups

Bromage score	Prilocaine group (n=37)	Bupivacaine group (n=37)	U	P-value
At 5 minutes • **Mean ± SD** • **Range**	2.84±0.37 (2 – 3)	2.68±0.48 (2 – 3)	574	0.11
At 10 minutes • **Mean ± SD** • **Range**	3±0 (3 – 3)	3±0 (3 – 3)	-	1.00
At 15 minutes • **Mean ± SD** • **Range**	3±0 (3 – 3)	3±0 (3 – 3)	-	1.00
At 20 minutes • **Mean ± SD** • **Range**	3±0 (3 – 3)	3±0 (3 – 3)	-	1.00

U: Mann-Whitney U test.
P≥0.05 was considered statistically non-significant.

Table (3): Comparison of visual analogue scale (VAS) score among the studied groups

VAS score	Prilocaine group (n=37)	Bupivacaine group (n=37)	U	P-value
At 1 hour • **Mean ± SD** • **Range**	0.54±0.51 (0 – 1)	0.49±0.51 (0 – 1)	647.5	0.65
At 2 hour • **Mean ± SD** • **Range**	1±0 (1 – 1)	0.95±0.23 (0 – 1)	647.5	0.16
At 4 hour • **Mean ± SD** • **Range**	3.05±0.47 (2 – 4)	1.49±0.51 (1 – 2)	27	<0.001*
At 8 hour • **Mean ± SD** • **Range**	3.62±0.95 (2 – 5)	2.38±0.49 (2 – 3)	209	<0.001*

VAS score	Prilocaine group (n=37)	Bupivacaine group (n=37)	U	P-value
At 12 hour • **Mean ± SD** • **Range**	4.08±0.95 (2 – 5)	4.38±0.49 (4 – 5)	599.5	0.31
At 24 hour • **Mean ± SD** • **Range**	3.92±1.23 (2 – 5)	3.95±0.82 (3 – 5)	660	0.78

U: Mann-Whitney U test,
** P≤0.001 was considered statistically highly significant.*
P≥0.05 was considered statistically non-significant.

Table (4): Block characteristics among the studied groups

Variables	Prilocaine group (n=37)	Bupivacaine group (n=37)	U	P-value
Onset of sensory block (minutes) • **Mean ± SD** • **Range**	5.49±2.14 (3 – 10)	5.97±2.44 (3 – 10)	638	0.58
Onset of motor block (minutes) • **Mean ± SD** • **Range**	6.32±1.24 (3 – 10)	6.49±1.56 (3 – 10)	742	0.43
Regression of motor block (hours) • **Mean ± SD** • **Range**	2.84±0.69 (2 – 4)	5.28±0.69 (4.3 – 6)	0.00	<0.001**
Regression of sensory block (hours) • **Mean ± SD** • **Range**	3.46±0.56 (2.5 – 4.5)	5.8±0.66 (4.5 – 6.5)	3	<0.001**
Independent patient ambulation (hours) • **Mean ± SD** • **Range**	3.68±0.75 (3 – 5)	6.22±0.79 (5 – 7)	24	<0.001**
1st time of rescue analgesia (hours) • **Mean ± SD** • **Range**	3.19±0.61 (2.5 – 5.5)	6.08±0.57 (5 – 7.5)	8	<0.001**
Total amount of analgesia within 1st 24 hours (Diclofenac Sodium) (mg) • **Mean ± SD** • **Range**	111.5 ± 38 (75 – 150)	93.2 ± 32.6 (75 – 150)	518	0.03*

U: Mann-Whitney U test,
** P<0.05 was considered statistically significant.*
*** P≤0.001 was considered statistically highly significant.*
P≥0.05 was considered statistically non-significant.

Table (5): Post-operative outcome among the studied groups

Variables	Prilocaine group (n=37)	Bupivacaine group (n=37)	Test value	P-value
	N (%)	N (%)		
Patient satisfaction				
• **Not satisfied**	15 (40.5%)	7 (18.9%)	4.14 [a]	0.04*
• **Satisfied**	22 (59.5%)	30 (81.1%)		
Surgeon satisfaction				
• **Not satisfied**	0 (0%)	4 (10.8%)	F [b]	0.12
• **Satisfied**	37 (100%)	33 (89.2%)		
Adverse effects				
• **None**	26 (70.3%)	9 (24.3%)	4.38 [a]	0.04*
• **Bradycardia**	0 (0%)	2 (5.4%)	F [b]	0.15
• **Headache**	6 (16.2%)	1 (2.7%)	F [b]	0.26
• **Hypotension**	4 (10.8%)	13 (35.1%)	F [b]	0.03*
• **Nausea**	1 (2.7%)	8 (21.6%)	F [b]	0.03*
• **Vomiting**	0 (0%)	4 (10.8%)	F [b]	0.04*
Apgar score 1 minute				
• **Mean ± SD**	9.59±0.49	9.54±0.51	648 [c]	0.65
• **Range**	(9 – 10)	(9 – 10)		
Apgar score 5 minutes				
• **Mean ± SD**	10±0	10±0	-	1.00
• **Range**	(10 – 10)	(10 – 10)		

[a] *Chi-square test.*
[b] *Fisher's exact test.*
[c] *Mann-Whitney U test.*
** P<0.05 was considered statistically significant.*
P≥0.05 was considered statistically non-significant.

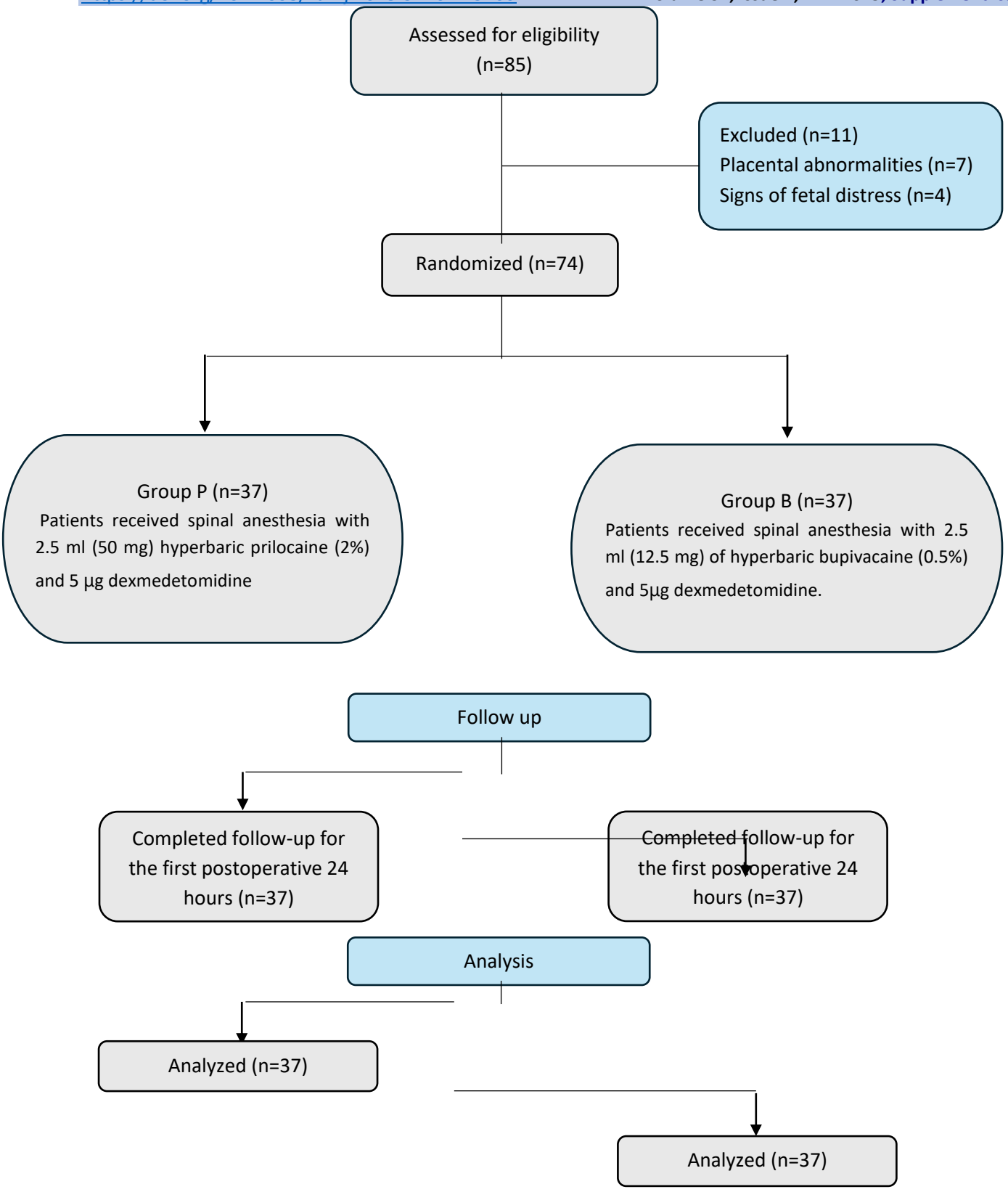

Figure (1): CONSORT flow diagram.

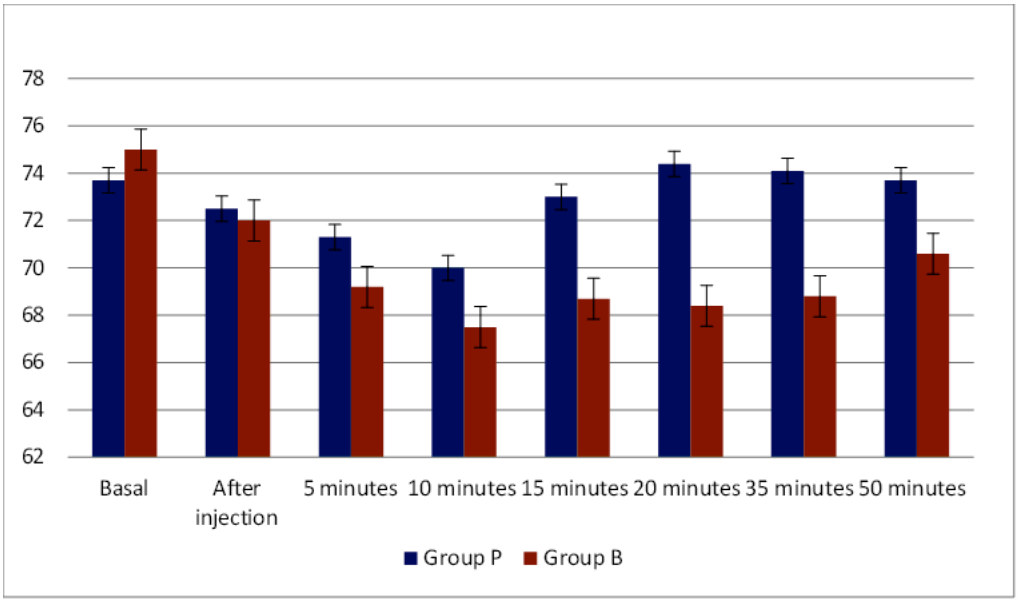

Figure (2): Comparison of intra-operative mean arterial pressure among the studied groups. *Group P: Prilocaine group, Group B: Bupivacaine group.*

DISCUSSION

Dexmedetomidine is used as an adjuvant in our study as it's proved to prolong the duration of the analgesic effect of local anesthetics and consequently decrease the consumption of opioids [15].

The hyperbaric preparation of prilocaine has several advantages over normal prilocaine, including a shorter time to first void, a faster recovery, and a speedier commencement of action. Nevertheless, due to its shorter duration of action, the analgesic duration is reduced and the requirement for postoperative analgesics is increased. Bupivacaine is known for its potency and prolonged duration of action that may lead to many side effects. However, it reduces the consumed analgesia [16].

In the current study regarding the comparison of VAS scores among the prilocaine and bupivacaine groups, with the exception of 4 and 8 hours, when the prilocaine group had a higher VAS score, when comparing the two groups' VAS scores, no statistically significant difference was found. In comparison to the bupivacaine group, the prilocaine group required more rescue analgesics within the first day and used them for a shorter period of time.

The reason the prilocaine group had higher VAS scores at 4 and 8 hours compared to the bupivacaine group could be because prilocaine has a shorter duration of effect. Prilocaine provides a faster onset of anesthesia but with a shorter duration, which may lead to a quicker onset of postoperative pain as the anesthetic effect diminishes. Consequently, patients in the prilocaine group might experience increased pain levels earlier, reflected in the higher VAS scores at these time points, shorter time for 1st rescue analgesia, and higher total consumed rescue analgesia within the first 24 hours postoperatively. In contrast, bupivacaine's longer-lasting effects maintain effective analgesia for a more extended period, resulting in lower VAS scores and total rescue analgesia consumption during the same postoperative timeframe [17-19].

In this study, when we assessed the effects of prilocaine at 4 and 8 hours, we discovered that the prilocaine group performed better. This was in line with the postoperative pain VAS score at 30 minutes, 1 hour, 1.5 hours, and 2 hours for elective inguinal hernia repair surgery, where the groups that received bupivacaine and prilocaine with dexmedetomidine did not differ significantly from one another, according to Amr et al. [20].

Additionally, Etriki et al. [10] revealed that there was a notable difference in VAS scores between the groups treated with 15 mg hyperbaric bupivacaine 0.5% and 60 mg hyperbaric prilocaine 2%, both upon admission to the PACU and upon discharge. The two groups' VAS scores did not differ significantly after two or four hours in the ward. We hypothesized that our results would be different from theirs because we used dexmedetomidine as an

adjuvant and since our procedures of choice were caesarian sections instead of their day case surgeries.

Comparing the two groups' block characteristics, we found no statistically significant differences in the time it takes for sensory and motor block to begin in the prilocaine and bupivacaine groups. However, when it comes to the duration it takes for these blocks to regress, the bupivacaine group outperforms the prilocaine group in terms of independent patient ambulation and motor block.

The observed differences in block characteristics between the two groups are likely due to the distinct pharmacokinetic profiles of bupivacaine and prilocaine. Bupivacaine, with its higher potency and longer duration of action, produces a more extended sensory and motor block. This prolonged blockade results in a delayed regression of both motor and sensory functions, extended time before patients can ambulate independently. Meanwhile, prilocaine allows earlier ambulation that could be an advantage in these cases to allow early interaction between the mother and her infant and early discharge [21, 22].

For elective caesarean procedures, Goffard et al. [4] observed that compared to the bupivacaine group, the hyperbaric prilocaine group had a much shorter median motor block. Consistent with previous research, this study discovered that the first independent ambulation occurred sooner after prilocaine administration.

The bupivacaine-dexmedetomidine group outperformed the prilocaine-dexmedetomidine group in terms of both the duration of sensory block and the Bromage score, according to research by Amr et al. [20]. Aside from that, the bupivacaine-dexmedetomidine group's motor and sensory block lasted far longer than the prilocaine-dexmedetomidine group's.

Results regarding intraoperative heart rates and oxygen saturation were similar between the prilocaine and bupivacaine groups, suggesting that the two anesthetics had similar effects on heart rates during surgery.

The current study's findings corroborated those of Etriki et al. [10], who found no statistically significant variations in HR intraoperatively or postoperatively or in oxygen saturation between the groups examined at various time points.

This study showed a statistically significant increase in intraoperative mean arterial pressure (MAP) in the prilocaine group at 5, 10, 15, 20, 35, and 50 minutes during surgery compared to the bupivacaine group.

Higher MAP observed in the prilocaine group compared to the bupivacaine group can be attributed to the differences in the pharmacological properties of the local anesthetics. Prilocaine, with its shorter duration of action and lower potency, may result in a less profound sympathetic block, thereby maintaining more sympathetic tone and causing less vasodilation leading to higher MAP values during surgery and in the early postoperative period. In contrast, bupivacaine provides a more sustained and potent sympathetic blockade, which might contribute to lower MAP and more significant hypotension during surgery. The rapid recovery of sympathetic function with prilocaine could further explain the higher MAP values observed in the intraoperative and early postoperative periods [23-25].

Hyperbaric bupivacaine significantly reduced MAP at 10 minutes compared to hyperbaric prilocaine in a study of perianal operations conducted by Nasr [13]. Despite this, there were no consistently different levels of postoperative MAP between the two groups. We hypothesized that the discrepancy in the results might be due to the fact that they utilized lower dosages of the drugs—1.5 ml of hyperbaric bupivacaine (7.5 mg) and 1.5 ml of hyperbaric prilocaine (30 mg)—compared to our current study.

Furthermore, Etriki et al. [10] did not find a statistically significant difference ($P > 0.05$) between the prilocaine and bupivacaine groups in terms of intraoperative and postoperative MAP. Intraoperative MAP significantly decreased in the same group as compared to baseline ($P < 0.05$).

This could be justified that dexmedetomidine in our study could add a hypotensive effect. Also the higher level of sensory block that was needed to be reached in our surgery (T4) may be associated with sympathetic blockade. Moreover, the pregnant female could be sensitive to hypotensive effects due to aortocaval compression as well as blood loss that reaches at least 1000cc during our surgery, unlike their day case surgeries [26].

The current study showed a statistically significant difference in side effects between the bupivacaine and prilocaine groups, with the bupivacaine group experiencing a significantly higher incidence of hypotension, nausea, and vomiting.

The differences in adverse effects between the bupivacaine and prilocaine groups can be attributed to the fact that bupivacaine can lead to significant

hemodynamic changes such as hypotension, as well as subsequent higher incidences of nausea and vomiting [27]. The shorter half-life of prilocaine, on the other hand, lessens the potential for serious adverse effects like hypotension and gastrointestinal problems while reducing the amount of hemodynamic disruption [28].

We found that bupivacaine significantly increased the incidence of maternal hypotension (P = 0.033), which is in line with the findings of Goffard et al. [4].

Contrary to what Chapron et al. [1] found, we found that prilocaine significantly reduced maternal hypotension after cesarean sections compared to bupivacaine. Their study likely utilized different quantities and medication combinations, which could explain the disparity. The 3.6 ml administered to the patients in the prilocaine group consisted of 6 milligrams (3 milliliters) of hyperbaric prilocaine 2%, 100 micrograms (0.1 milliliter) of morphine, and 25 micrograms (0.5 milliliter) of sufentanil. In contrast, the treatment group that received bupivacaine had 3.1 ml of medication, comprising 12.5 mg (2.5 ml) of hyperbaric bupivacaine 0.5%, 100 µg (0.1 ml) of morphine, and 2.5 µg (0.5 ml) of sufentanil. Because of these variations in dosage and concentration, the two trials may have shown different outcomes.

In the current study, when comparing the bupivacaine and prilocaine groups, patient satisfaction was greater in the former. When it came to the satisfaction of the obstetricians, though, there was no discernible difference between the categories.

In contrast to Chapron et al. [1], our research showed that both patients and obstetricians were quite satisfied with the anesthetic level in the prilocaine and bupivacaine groups.

Limitations of the study

The findings of the present study may not be applicable to a broader population due to our study's limitations, one of which is the small sample size. Another possible source of selection bias is that the study only used data from one location. Beyond the first postoperative recovery phase, we did not evaluate chronic pain, patient mobility, or neonatal outcome, all of which are long-term postoperative outcomes. Furthermore, while we evaluated key parameters such as hemodynamics and block characteristics, more comprehensive assessments of other potential side effects, such as sedation levels or cognitive effects, were not included. To confirm and broaden our findings, future research should use bigger, more diverse populations and longer follow-up times.

CONCLUSION

In conclusion, hyperbaric prilocaine (2%) with dexmedetomidine was as effective and safe as hyperbaric bupivacaine (0.5%) with dexmedetomidine in achieving spinal anesthesia for elective cesarean sections, offering adequate postoperative analgesia and early ambulation. Prilocaine was associated with fewer adverse effects, such as lower incidences of hypotension, nausea, and vomiting. However, bupivacaine demonstrated a longer duration of sensory and motor block, delayed time to first rescue analgesia, lower consumption of rescue analgesia, and higher patient satisfaction. Thus, while both anesthetic combinations were effective, prilocaine may offer a quicker profile with fewer side effects, making it a suitable alternative for patients at higher risk of adverse events.

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Citation

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