Section: Anesthesiology

Research

A RANDOMIZED CONTROL TRIAL TO COMPARE THE EFFECT OF VARYING DOSES OF INTRATHECAL FENTANYL ON CLINICAL EFFICACY AND SIDE EFFECTS IN PARTURIENT UNDERGOING CAESAREAN SECTION

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Abstract

Background: Spinal anaesthesia, a type of regional anaesthesia, is a safe and dependable means of providing anaesthesia as well as appropriate analgesia in infra-umbilical surgery. Intrathecal administration of lipophilic opioids like Fentanyl has proven to enhance spinal anesthesia and provide superior analgesia. This study's objectives were to evaluate the clinical efficacy of intrathecal fentanyl at various doses and assess its negative effects on caesarean delivery patients. **Materials and Methods:** The current prospective study cohort includes 120 patients, who were further divided into three groups of 40 individuals each. Group A, B and C received 10, 15 and 25 mcg of intrathecal fentanyl. When assessing the clinical efficacy of this study, factors such as the quality of the employed surgical anaesthetic, the onset and duration of the block, the occurrence of any subsequent adverse effects, hemodynamic stability, and the requirement for rescue analgesia were taken into account. **Result:** A comparative study between the three groups administered with varying dosages of fentanyl indicated that the group receiving the highest dosage (25 mcg) of Fentanyl showed a significantly slower onset of sensory and motor blockage while exhibiting a longer duration of analgesia. in comparison with groups A and B, group C showed a significantly slower onset of sensory and motor blockade while exhibiting a longer duration of analgesia. Intraoperative complications such nausea, Bradycardia, vomiting, and pruritis were seen in 1, 0, 1, and 2 cases in group A, while they were seen in 1, 0, 2, and 2 cases in group B, and in 1, 2, and 5 cases in group C, respectively. The requirement of rescue analgesia was significantly lower in group C as compared to group A and B. **Conclusion:** For caesarean sections performed under spinal anaesthesia, 15 mcg of intrathecal fentanyl is the ideal dosage to supplement intrathecal hyperbaric bupivacaine.

INTRODUCTION

Spinal anaesthesia (SA) is a type of regional anaesthesia in which a local anaesthetic is injected into the cerebrospinal fluid (CSF) via a spinal needle in the subarachnoid space. It is a safe, reliable and economical technique for anaesthesia and adequate analgesia in infra-umbilical surgeries (lower abdomen, pelvic, lower limb), thus providing rapid anaesthesia with muscle relaxation to patients undergoing caesarean section.[1] SA, also being a type of neuraxial anaesthesia which utilizes only local anaesthetics, has been reported to provide suboptimal analgesia but with consequential high side effects. Thus, several drugs with high analgesic effects and lower side effects have been added to local anaesthesia which include opioids, epinephrine, clonidine, ketamine, midazolam and magnesium.[2,3] Lipophilic opioids when administered intrathecally as an adjunct to local anaesthesia enhance spinal anaesthesia and analgesia without prolonging motor recovery and discharge time.[4] Fentanyl is a lipophilic opioid that exhibits close structural similarities to local anaesthesia and has demonstrable local anaesthetic efficacy on sensory C primary afferent nerve fibers, which may facilitate analgesic effects.[5,6] It can be injected both intrathecally and epidurally as a part of spinal and epidural anaesthesia respectively. Furthermore, because of its high lipid solubility, the effect of fentanyl is more localized

than that of morphine. Fentanyl is also the most frequently used intrathecal lipophilic opioid which when administered as an analgesic agent result in minimal cephalad spread making it the least likely of all the intrathecal opioids to cause delayed respiratory depression.[5]

When administered to parturient, the advantages of analgesia have to be balanced against side effect such as bradycardia, respiratory depression, arterial hypotension, nausea, vomiting and pruritus. It has been previously reported that a single administration of an opioid may also induce a long-lasting increase of threshold pain sensitivity, leading to delayed hyperalgesia.[7] Bupivacaine is frequently used to block the subarachnoid space in women having caesarean deliveries, however intrathecal bupivacaine alone may not suffice to provide complete anaesthesia and analgesia. In such cases, to improve the quality of the subarachnoid block, the addition of intrathecal opioids has become a common approach. Therefore, introducing a lipophilic short-acting opioid like Fentanyl to local anaesthetics has the potential to increase the effectiveness and duration of anaesthesia and analgesia in the obstetric population. Intrathecal fentanyl, however, has been linked to adverse reactions such as nausea, vomiting, itching, and respiratory depression. Previous trials comparing different dosages of intrathecal fentanyl for clinical effectiveness did not yield significant findings in detecting variations in secondary outcome factors such as these side-effects. Thus, the goal of this study was to examine the clinical effectiveness and side effects of different dosages of intrathecal fentanyl (10mcg, 15mcg, and 25mcg) in parturient undergoing caesarean section under spinal anaesthesia.

MATERIALS AND METHODS

Study Design

This randomized study was conducted in the Department of Anaesthesiology at the Dr. D. Y. Patil Medical College, Hospital and Research Centre, Nerul, Navi Mumbai, from November 2018 to November 2020. The present study was duly approved by the Institutional Ethics committee of D. Y. Patil Deemed to be University (IEC Ref No: DYP/IEC/03-0113/2019). Each participant provided valid informed written consent before being included in the research.

Eligibility Criteria

The study population was chosen on the basis of pre-decided inclusion criteria as follows,

a)Full-term pregnant patients between the ages of 20 to 40 years belonging to ASA grade I and II, b) Women who are scheduled for elective caesarean section under subarachnoid block.

Females who met the exclusion criteria given below were prohibited from participating in the research,

a) Women having a Body mass index (BMI)>30, belonging to ASA grade III or more, b) Patients with pre-existing or pregnancy-induced hypertension, cardiovascular or cerebrovascular disease, neuropathies, allergic reactions to the drugs used in the study and contraindication for subarachnoid block.

Sample Size

The study population consisted of 120 participants who were randomly allocated to one of the 3 groups.

Group A: Patients who receive 10 mcg intrathecal fentanyl (N=40)

Group B: Patients who receive 15 mcg intrathecal fentanyl (N=40)

Group C: Patients who receive 25 mcg intrathecal fentanyl (N=40)

Preparation of Parturient and Randomization

The patients were told to rate their pain on a scale of 0 to 10 and to report the existence of pruritus and nausea at any moment during their stay in the operating room (OR) and recovery room (RR). All patients fasted for at least 6 hours before surgery and were premedicated intravenously with ranitidine (50 mg) and metoclopramide (10 mg) half an hour before surgery. When the patient arrived in the operating room, 15 ml/kg of intravenous fluids (lactated Ringer's solution) were administered over 15 minutes during the induction of spinal anaesthesia. Electrocardiogram (ECG), heart rate (HR), non-invasive blood pressure (NIBP), and pulse oximetry were all monitored (SPO_2).

All patients were administered a total volume of 2.5 ml, which included 2 ml of 0.5% hyperbaric bupivacaine and 0.5 ml of solution containing 10 mcg (Group A), 15 mcg (Group B), or 25 mcg (Group C) of preservative-free fentanyl. To acquire the appropriate volume of 2.5 ml, the study drug was diluted with normal saline.

Study Protocol

Spinal anaesthesia was performed by the anaesthesiologist where the same surgical and anaesthetic procedure was used in all patients. After all aseptic precautions were taken, the skin was infiltrated with 2% lignocaine by placing a 25G Quincke's spinal needle at the L3-4 or L4-L5 intervertebral area with the patient seated. The study drug was delivered in the subarachnoid zone over 20-30s after assuring an unrestricted flow of cerebrospinal fluid. Patients were instantaneously placed in a supine position. All patients were given oxygen (4 l/min) using facemasks. The heart rate (HR), systolic blood pressure (SBP), diastolic blood pressure (DBP), and mean arterial pressure (MAP) at baseline (5 min after stabilization of patient in the OR), at the time of institution of spinal anaesthesia at every 2 min for first 10 min then every 5 min for half an hour and every 10 min for the rest of the surgery were recorded.

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6 mg intravenous ephedrine was employed to treat hypotension caused due to a reduction in SBP of more than 30% below the baseline level. Bradycardia (HR <45 bpm) was treated with intravenous atropine 0.6mg or glycopyrrolate 0.2mg. Vomiting was treated with intravenous ondansetron 4mg.

Sensory block assessment was done by observing onset, duration and level using a pinprick test. By testing in the midclavicular line downward, starting from T2, using an arm with unblocked C5-C6 dermatomes as reference point. In motor block assessment total duration of motor block and time for maximum degree motor block was also noted. Onset and density of block using the Modified Bromage Scale was calculated in accordance with the modified Bromage scale utilized by Abdelgalel et al and colleagues.[8]

Parameter Assessment

Hemodynamic Changes: The parameters such as heart rate (HR), non-invasive blood pressure, and Spo_2 were periodically monitored every 2 minutes from the time of injection for the first 10 minutes, then every 5 minutes for half an hour and every 10 minutes for the rest of the surgery and then at an hour interval until the patient complained of pain or VAS of 5 in the postoperative period.

Sensory Block: Onset of sensory block, highest sensory level attained, time from injection to highest sensory level were noted. The cephalad spread of analgesia was recorded. The level of sensory blockade was assessed and recorded as analgesia to loss sensation to pin prick. Time taken for sensory regression to L1 dermatome was noted.

Motor Block: The onset of the motor block and the time required for the motor block to regress were recorded. The Modified Bromage Scale was used to detect motor blockage.[8]

Duration of Total Analgesia: It is the time interval from the time of onset of subarachnoid block to the time of administration of first rescue analgesic, when the VAS score is 5. Inj Paracetamol 1gm i.v. was used as rescue analgesia.

Side Effects: Adverse effects such as nausea, vomiting, dizziness, and itching, as well as a drop in saturation to 90 and a respiration rate of 8 per minute, were observed in both the OR and the RR. Patients were instructed to report any symptoms of nausea, vomiting, or dizziness. We regarded the occurrence of one episode of any of these side effects to be a good event, regardless of its frequency or severity. Any patient who complained of the above-mentioned side-effects was assessed every 15 min in the OR and RR and was treated according to the hospital protocols.

Patients were observed in the RR for 2 hr. The motor blockage was thought to be recovered when the patient was able to bend her knee (Bromage scale 6).

Statistical Analysis

All the collected data was entered in Microsoft Excel sheet and then transferred to SPSS software ver. 22 for analysis. For qualitative data, the Chi-Square test was used, for two group comparison. Unpaired student 't' test for intergroup comparisons and for intragroup comparisons. P - value of <0.05 was considered statistically significant and that of <0.001 was considered highly statistically significant.

RESULTS

When the demographics of all three groups were compared, it was revealed that the mean age of patients in Groups A, Group B and Group C was 23.69± 14.91 years, 22.50 ± 10.65 years and 23.23 ± 14.23 years respectively. Statistically, there was no significant difference among the groups (p= 0.585). The mean weight of patients in Groups A, Group B and Group C was 65.19 ± 6.08 kg, 66.73 ± 7.6 and 66.43 ± 6.1 kg respectively. Statistically, there was no significant difference among the groups (p= 0.218). The mean height of patients in Groups A, Group B and Group C was 164.71 ± 8.7 cm, 163.12± 7.6 cm and 160.14 ± 5.2 cm respectively. Statistically, there was no significant difference among the groups (p= 0.923). ASA Physical Status Ratio (I/II) was 23/17 in Group C, 22/18 in Group A, 24/16 in Group B. All 3 groups did not differ significantly in their ASA Physical status (P value =0.076).

Table 1: Demographics of the sample population

	Group A	Group B	Group C	p value
Age (years)	23.69 ± 14.91	22.50 ± 10.65	23.23 ± 14.23	0.585
Weight (kg)	65.19 ± 6.08	66.73 ± 7.6	66.43 ± 6.1	0.218
Height	164.71 ± 8.7	163.12 ± 7.6	159.14 ± 5.2	0.923
ASA (I/II) I II	 23 17	 22 18	 24 16	0.076

Data is represented as mean+S.D or absolute numbers. P value <0.05 is statistically significant.

[Tables 2-5] represent the comparative data of hemodynamic changes among three study groups which include the Heart rate (HR), SBP, DBP and MAP respectively. It was observed that all the parameters experienced a steady decline where all the three study groups were statistically insignificant. Table 6 represents the data of SpO2 where, there was no significant difference in SpO2 in all the groups at different time intervals.

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Table 2: Comparison of mean Heart rate at different time intervals in all the Groups

Mean Heart Rate (Min)	Group A	Group B	Group C	p value
Baseline	84.87+5.98	85.40+6.89	84.87+5.49	0.928
2	84.53+5.89	84.93+6.72	83.93+5.58	0.815
4	84.33+5.82	84.27+6.74	83.43+5.31	0.811
6	84.07+5.95	83.93+6.74	83.13+5.16	0.81
8	82.20+5.90	82.20+5.90	78.6+4.81	0.018
10	81.80+4.61	80.20+5.88	75.6+2.25	0.562
15	81.53+4.65	79.07+4.54	73.6+2.19	0.981
20	80.53+3.40	77.93+3.30	71.87+2.40	0.533
25	78.93+2.50	76.40+2.79	69.93+1.78	0.891
30	77.67+2.17	75.67+2.17	68.6+1.75	0.453
40	75.33+2.94	73.33+2.18	67.93+3.17	0.326
50	73.73+2.91	71.27+1.92	66.13+2.03	0.453
60	71.33+2.36	69.60+1.92	65.67+1.66	0.933
70	73.73+1.79	72.33+1.18	70.27+2.33	0.287
80	76.67+2.30	76.20+2.53	75.2+2.07	0.048
90	77.93+2.37	77.40+3.28	76.87+2.50	0.329
120	82.93+1.55	81.20+4.99	81.07+2.14	0.053

Data is represented as mean+S.D or absolute numbers. P value <0.05 is statistically significant.

Table 3: Comparison of mean SBP at different time intervals in all the groups

Mean SBP (Min)	Group A	Group B	Group C	P value
Baseline	126.27+9.39	126.6+10.03	127.93+11.35	0.803
2	124.67+8.47	125.53+9.86	126.47+10.34	0.768
4	123.2+8.735	124.07+7.56	125.20+9.53	0.669
6	122.93+8.03	123.33+7.8	122.2+7.20	0.847
8	118.73+5.74	119.87+5.84	120.4+6.17	0.541
10	120.20+3.72	120.07+4.15	117.6+4.43	0.026
15	119.93+3.42	119.73+3.88	116.93+4.02	0.08
20	119.60+3.42	118.87+ 3.70	115.93+3.58	0.064
25	118.67+3.20	118.13+3.40	114.07+2.94	0.452
30	116.33+2.46	117.33+ 2.84	112.07+2.25	0.564
40	115.2+2.26	115.93+ 2.70	110.07+2.31	0.832
50	113.8+2.36	114.33+ 2.29	109.80+2.31	0.891
60	112.6+1.97	113.27+ 1.92	107.93+0.82	0.785
70	110.93+1.55	112.13+ 1.73	106.93+1.01	0.255
80	112.33+2.23	111.4 +2.04	111.13+1.87	0.065
90	116.07+1.85	115.47+ 1.88	114.93+2.50	0.119
120	117.87+2.03	116.93+ 1.55	116.27+3.59	0.055

Data is represented as mean+S.D or absolute numbers. P value <0.05 is statistically significant.

Table 4: Comparison of mean DBP at different time intervals in all the groups

Mean DBP (Min)	Group A	Group B	Group C	p value
Baseline	81.60+3.08	80.20+4.40	79.87+4.45	0.216
2	79.53+4.02	79.33+4.01	78.67+3.87	0.677
4	78.13+3.27	77.80+3.25	77.73+3.81	0.891
6	77.40+2.88	76.53+2.82	76.20+2.89	0.252
8	76.80+2.85	76.07+2.99	72.93+2.01	0.782
10	75.73+2.81	75.53+2.27	71.93+1.78	0.918
15	75.07+2.71	74.27+2.27	70.27+1.94	0.211
20	74.80+2.65	73.67+2.41	68.47+2.50	0.981
25	73.67+2.41	72.73+2.06	66.60+3.32	0.399
30	72.80+2.14	71.93+2.31	64.47+2.27	0.483
40	71.07+1.79	70.40+2.99	62.80+1.34	0.392
50	70.20+2.31	69.33+1.91	61.13+1.13	0.891
60	69.67+2.29	68.07+0.64	60.07+1.43	0.822
70	68.53+2.09	67.93+0.64	66.60+3.32	0.07
80	72.67+2.64	71.53+2.33	71.73+2.44	0.173
90	78.60+3.06	77.4+4.492	77.73+3.81	0.461
120	80.60+4.23	80.47+4.508	79.27+3.61	0.393

Data is represented as mean+S.D or absolute numbers. P value <0.05 is statistically significant.

Table 5: Comparison of mean MAP at different time intervals in all the groups

Mean MAP (min)	Group A	Group B	Group C	P value
Baseline MAP	81.60+3.08	80.27+4.41	79.73+4.51	0.191
2	79.53+4.02	79.40+4.00	78.60+3.90	0.618
4	78.13+3.27	78.07+3.30	77.67+3.82	0.854
6	77.93+2.54	77.2+2.60	76.20+2.89	0.08
8	77.07+2.55	76.13+3.01	72.73+1.92	0.09

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10	76.27+2.71	75.80+2.31	71.87+1.73	0.056
15	75.13+2.71	74.40+2.31	70.33+1.97	0.865
20	75.07+2.76	73.73+2.39	68.33+2.52	0.353
25	74.13+2.67	72.80+2.00	66.40+3.16	0.653
30	73.07+2.14	72.07+2.31	64.53+2.28	0.897
40	71.73+2.01	70.13+2.82	62.73+1.23	0.465
50	70.33+2.17	69.40+1.90	61.20+1.12	0.853
60	69.80+2.18	68.20+0.61	59.93+1.53	0.943
70	68.67+2.05	68.07+0.82	66.73+3.21	0.08
80	73.87+ 2.46	72.93+2.08	72.27+2.44	0.093
90	78.80+2.44	77.40+4.51	77.8+3.80	0.35
120	81.67+2.92	80.60+4.61	79.40+3.56	0.072

Data is represented as mean+S.D or absolute numbers. P value <0.05 is statistically significant.

Table 6: Comparison of mean SpO2 at different time intervals in all the groups

Mean SpO_2 (Min)	Group A	Group B	Group C	p value
Baseline SpO_2	99.13+0.97	99.03+0.92	98.97+0.86	0.782
2	99.93+0.25	100+0.000	99.93+0.25	0.359
4	99.97+0.18	99.93+0.25	99.93+0.36	0.866
6	99.93+0.25	99.87+0.43	99.97+0.18	0.446
8	99.93+0.25	100+0.000	99.93+0.25	0.359
10	99.90+0.30	100+0.000	99.93+0.25	0.233
15	99.93+0.25	99.97+0.18	99.93+0.25	0.814
20	99.90+0.30	100+0.000	99.87+0.34	0.136
25	99.90+0.30	100+0.000	99.90+0.30	0.206
35	99.90+0.30	100+0.000	99.93+0.25	0.233
40	99.87+0.34	99.87+0.34	99.87+0.34	1
50	99.77+0.56	99.73+0.58	99.73+0.58	0.967
60	99.93+0.25	100+0.000	99.93+0.25	0.359
70	99.90+0.30	100+0.000	99.93+0.25	0.233
80	99.93+0.25	99.97+0.18	99.93+0.25	0.814
90	98.87+1.07	99.10+1.15	99.03+1.15	0.713
120	98.87+1.07	99.10+1.15	99.03+1.15	0.713

Data is represented as mean+S.D or absolute numbers. P value <0.05 is statistically significant.

By observing [Table 7], it can be deduced that the onset of sensory and motor blockade was significantly slower in group C (p=0.0001) as compared to group A and B. Similarly, the duration of sensory and motor blockade in group C (p=0.0001) was longer than group A and B.

Table 7: Onset and Duration of Sensory and Motor Blockade

	Group A	Group B	Group C	P value
Onset of sensory blockade (min)	3.38 ± 1.10	4.97 ± 1.47	5.90 ± 1.21	0.0001
Onset of Motor blockade (min)	5.93 ± 1.36	6.70 ± 1.64	7.17 ± 1.29	0.0001
Duration of sensory blockade (min)	522 ± 50	870 ± 78	1169 ± 47	0.0001
Duration of Motor blockade (min)	442± 48	754 ± 75	1023± 51	0.0001

Data is represented as mean+S.D or absolute numbers. P value <0.05 is statistically significant.

[Table 8] represents the duration of analgesia amount all the groups which indicates that the duration of analgesia was significantly longer in group C (p=0.0001) as compared to group A and B.

Table 8: Duration of Analgesia among different groups in the study population

	Group A	Group B	Group C	p value
Duration of analgesia	584 ± 56	998 ± 79	1204 ± 46	0.0001

Data is represented as mean+S.D or absolute numbers. P value <0.05 is statistically significant.

The intra-operative side effects represented by [Table 9] indicate that the intraoperative side effects like nausea, bradycardia, vomiting and pruritis was observed in 1,0,1, and 2 cases while in group B it was observed in 1, 0, 2,2 cases respectively and in group C it was observed in 1,2,5,8 cases respectively. Furthermore, group C showed a significantly lower requirement of rescue analgesia as compared to groups A and B.

Table 9: Intraoperative side effects and rescue analgesia in all groups

Intra-operative Side-Effects	Group A	Group B	Group C
Nausea	1 (2.5%)	1(2.5%)	1 (2.5%)
Bradycardia	0	0	2 (5%)
Vomiting	1 (2.5%)	2 (5%)	5 (12.5%)
Pruritis	2 (5%)	2 (5%)	8 (20%)
Rescue Analgesia	Group A	Group B	Group C
Yes	8 (20%)	4 (10%)	1 (2.5%)

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No	32 (80%)	36 (90%)	39 (97.5%)
Total	40 (100%)	40 (100%)	40 (100%)

DISCUSSION

Post-operative pain is an essential concern for several patients and anaesthetists who have long been concerned about providing adequate pain treatment, particularly in the immediate post-operative period. The main goal of postoperative pain management is to alleviate discomfort while minimizing negative effects which can be achieved by employing a multimodal approach.

Multimodal analgesia has become a widely utilized technique in post caesarean section pain management which generally involves the use of hydrophilic opioids like Morphine. Morphine, however, exhibits a late commencement of action that typically eliminates any intraoperative analgesic benefit and generates a high incidence of side effects such as nausea, vomiting, itching, and, in rare circumstances, potentially dangerous late respiratory depression.[9-12] Hence, Currently, a huge proportion of the world's medical facilities do not employ intrathecal morphine. [13-16]

Fentanyl is a regularly used intrathecal lipophilic opioid that is distinguished by its ability to produce fast effects in a short amount of time. Its pharmacological properties improve its potential to confer superior intraoperative analgesia with prolonged effects.[9] As fentanyl is able to show its effects in a short duration time, the major goal of this study was to determine the efficacy of intrathecal fentanyl during the period of peak postoperative demand for analgesics following caesarean operation. The demographic profile of all three groups in this study revealed that the majority of patients (95-96%) experienced excellent surgical anaesthesia with all three fentanyl dosages, with just 6 (2.46%) requiring rescue intravenous analgesia and none requiring conversion to general anaesthesia. In comparison, previous studies have revealed a considerably increased percentage of unsuccessful blocks in individuals receiving 7.5 mcg intrathecal fentanyl.[17-18] In contrast to patients receiving 7.5 mcg of fentanyl, Chu et al. discovered that all patients receiving 12.5 and 15 mcg of intrathecal fentanyl with 0.5% hyperbaric bupivacaine exhibited exceptional intraoperative and postoperative analgesia.[17] Furthermore, Goel et al. found that patients who received 7.5 mcg of fentanyl in association with low-dose bupivacaine had a considerably larger percentage of failed blocks (nearly 27%) than those who received 10 or 12.5 mcg of fentanyl.[18] These findings suggest that intrathecal fentanyl dosages greater than 10 mcg are preferable. The lowest dosage of intrathecal fentanyl was administered in this study was 10 mcg. It was observed that there was no discernible change in the quality of surgical analgesia and anaesthesia produced by Fentanyl at this or any higher doses (15 and 25 mcg), which is in accordance with the findings of previous studies.[17,19]. Therefore, it can be deduced that raising the dosage of intrathecal fentanyl to more than 10 mcg has no noteworthy impact on the quality of surgical anaesthetic. When the mean age, weight, and height of patients in groups A, B, and C were examined, there was no significant difference between the groups. The ASA Physical Status Ratio (I/II) between the three groups did not significantly differ either.

The hemodynamic parameter assessment indicated a decline in the HR, SBP, DBP and MAP in all the three study groups though the difference was statistically insignificant. These results corresponded with the investigation conducted by Muhammad Asghar Ali et al., in which there was no significant differences in the MAP or highest decreased m2ean HR and mean SBP parameters among the three groups.[20]

In this study, it was observed that the onset of sensory and motor blockade was significantly slower in group C as compared to groups A and B. These findings are in line with those of Muhammad Asghar Ali et al and colleagues in terms of the duration of sensory and motor block, which was much longer in the groups given 15 and 25 mcg of fentanyl as opposed to those given 10mcg. [21] These findings were also congruent with those reported by Sonia Nahakpam et al., who discovered that the time necessary for the onset of motor block and to achieve the maximal motor block was substantially longer in the group given 25 mcg fentanyl. [22] Similar results were further reported by Ben David et al and colleagues as well.[23] Ali et al, on the other hand, refuted these findings, reporting no significant variations in the time between the beginning of sensory and motor block amongst the three groups. [21]. Moreover, in relation to the onset, the duration of sensory and motor blockade was significantly extensive in group C as compared to group A and B.

The dosage of intrathecal opioid given to the local anaesthetic is critical not only for the uniformity, but also for the onset and duration of the operative anaesthetic. Around 83,84,86 Opioids are able to disrupt pain in the dorsal horn while local anaesthetics inhibit motor and sensory nervous behaviour. It is possible that the addition of an opioid to the local anaesthetic may influence its effects and result in a shorter onset period, and a longer duration of sensory block. [24-27]. In patients who received local anaesthesia with opioid, Parpaglioni et al. noticed a shorter start time and a longer regression time. However, the time period required to achieve sensory block of T5 as well as motor block in all three groups was identical to the results in this research, suggesting that the onset of the block was influenced by opioids rather than dose of opioid. Furthermore, with increasing fentanyl dosage, the length of the motor and sensory block increased. Previous studies

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have also shown that the increase in opioid dose with local anaesthesia may have a synergistic impact that prolongs the length of the block. [18,24,28]

In this study, group C had considerably longer duration of analgesia than groups A and B. These findings were comparable with Sonia Nahakpam et al., in which recovery of sensory block was significantly longer ($p<0.05$) in group using 25 mcg fentanyl resulting in prolonged post-operative analgesia.[23,29,30] Thus, the sensory block was stronger and more potent at higher fentanyl dosages than at lower doses, which is consistent with the research done by Sowmya et al and associates.[31]

Furthermore, the assessment of side effects carried out in this study indicated that in group A intraoperative complications like nausea, Bradycardia, vomiting, and pruritis were observed in 1, 0, 1, 2 cases respectively, while in group B it was observed in 1, 0, 2,2 cases respectively and in group it was observed in 1,2,5,8 cases respectively. The side effects observed in the study included nausea, vomiting and pruritus. These findings corresponded with the studies demonstrated by Muhammad Asghar Ali et al., in which among the three groups, the incidence of pruritus was highest in the patients to whom 25 mcg of Fentanyl was administered.[21] These results were also in line with Hunt et al. who observed a substantial rise in the overall incidence of itching in individuals given 25 and 50 mcg of intrathecal fentanyl.[28] Similarly, Belzarena et al. found that the group of patients who received 20 mcg of intrathecal fentanyl experienced a vastly increased prevalence of pruritus[32]. In lower abdominal surgery, Seewal et al. discovered a significant incidence of pruritus when the fentanyl dosage was increased above 10 mcg [19]. Moreover, a multitude of previous investigations have evidenced that patients who have obtained 25 mcg and less intrathecal fentanyl demonstrated nonsignificant pruritus.[32,33]. One of the potential reasons for the inability to identify variations in the frequency of pruritus was that none of the studies assessed pruritus as their principal outcome.

Finally, we determined that in the present investigation, the need for employing rescue analgesia was considerably low in group C as compared to group A and B.

CONCLUSION

In this study we observed that in comparison to the two lower dosages (10 and 15 mcg), intrathecal fentanyl at a dose of 25 mcg enhanced analgesia or anaesthesia but increased the incidence of pruritus and nausea, whereas 10 mcg was linked to earlier development of pain in the RR. In light of this, we came to the conclusion that 15 mcg of fentanyl was the ideal dose of intrathecal fentanyl to augment intrathecal hyperbaric bupivacaine during caesarean delivery under spinal anaesthesia.

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