Original Research Paper

Volume-9 | Issue-3 | March-2019 | PRINT ISSN - 2249-555X

Anaesthesiology

COMPARISON OF TRAMADOL AND FENTANYL AS ADJUVANTS TO INTRATHECAL 0.5% HYPERBARIC BUPIVACAINE FOR LOWER ABDOMINAL AND LOWER LIMB SURGERIES

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ABSTRACT

INTRODUCTION: Intra thecal administration of Opioids as adjuvant, has been established to provide effective and prolonged postoperative analgesia in surgical procedures. 6000 fold reduced affinity of Tramadol for μ receptors, can be attributed to decreased incidence of its respiratory depressant effects.

METHODOLOGY: A prospective, randomized, single blinded study was conducted on 60 adult patients with ASA 1 & 2 status, posted for elective lower abdominal or lower limb surgeries. Patients in Group 'T' were given 25mg of Tramadol with 15mg of 0.5% Bupivacaine and Group 'F' were given 25mcg of Fentanyl with 15mg of 0.5% Bupivacaine, in spinal anaesthesia. Along with vital parameters, the time of onset of sensory and motor block, maximum level reached, time for regression, total duration of sensory block and analgesia in terms of VAS score, were recorded.

RESULTS: Change in vital parameters in the initial few minutes was comparable. Values on Modified Bromage scale were statistically significant during the first 2 minutes. Among the variables assessed, the time taken to reach the maximal dermatomal level, time to 2 segment regression, total duration of sensory block and the incidence of side effects were found to be statistically highly significant between the two groups.

Conclusion: Quality and length of both anaesthesia and analgesia is irrefutably better with Fentanyl as adjuvant when compared to Tramadol.

KEYWORDS : Tramadol, Fentanyl, 0.5% Bupivacaine, Spinal anaesthesia.

INTRODUCTION

Spinal anaesthesia is the most preferred regional anaesthesia technique as it is easy to perform, economical and produces rapid onset of anaesthesia and complete muscle relaxation. The aim of intrathecal local anaesthetic is to provide adequate sensory and motor block necessary for all lower abdominal and lower limb surgeries[1]. The sole essence of anaesthesia is relief of pain in intra and post operative period.

Over the last decade, there has been considerable experimentation on the use of adjuncts to local anaesthetic agents in central neuraxial blocks with the aim of prolonging the duration of sensory and motor block, providing good and adequate intra operative analgesia and reducing post operative analgesic requirements.

MATERIAL & METHODS

After taking Institutional Ethics Committee approval, 60 patients posted for elective surgeries under standard regional anaesthesia were selected randomly after applying the stringent inclusion and exclusion criterias. All the patients were randomly allocated into two groups, namely, Group 'T' & Group 'F'.

Thorough evaluation was pre-operatively, one day prior to surgery, which comprised of detailed history, general, physical and systemic examination of the patient. All the necessary and relevant laboratory investigations were done and written informed consent was taken. All the patients were kept nil per oral (NPO) for a period of at least 6 hours. Inside the operation theatre, all basic monitors were attatched and pre induction vital parameters such as pulse rate (PR), systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), SpO_2, Respiratory rate and ECG were recorded (T_0).

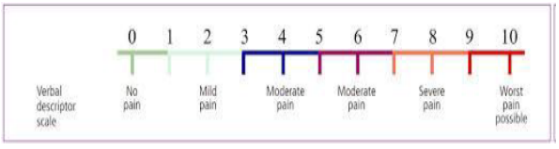
The drug to be given was prepared and the patients were kept blinded to the study drug. Spinal anaesthesia was given in the sitting position under all aseptic precautions. After painting and draping of the lumbar area, a 26 G Quincke's spinal needle was introduced in L2 -L3 or L3 - L4 inter vertebral space. Free flow of CSF was confirmed and subarachnoid anaesthesia was administered with the prepared drug solution.

Group T Inj.0.5% BUPIVACAINE 15mg (3ml) + Inj.TRAMADOL 25mg (0.5ml) Group F Inj. 0.5% BUPIVACAINE 15mg (3ml) + Inj.FENTANYL 25mcg (0.5ml) Needle was withdrawn carefully and patient was reverted back to supine position. Vital parameters were recorded (T_1). Patients were also monitored for any side effects of the study drug like nausea, vomiting, restlessness and pruritis.

Intra operatively pulse rate, non invasive blood pressure, electrocardiogram, SpO_2 was recorded at 1/2/5/10/15 & 30 minutes and thereafter till the end of the surgery and postoperatively for half an hour.

- Time of onset of sensory block was noted using pin prick method.
- Time of onset of motor block using Modified Bromage scale[2] was noted as follows.
- Bromage 0 – Legs and feet can be moved freely, with ability to raise the extended leg
- Bromage 1 – Unable to raise extended leg and knee flexion is decreased but feet and ankles can be fully flexed
- Bromage 2 – Unable to raise leg or flex knees but flexion of ankle and feet are present
- Bromage 3 – Unable to raise leg, flex knee, ankle or move toes
- Hypotension, defined as > 20 % fall of baseline systolic blood pressure, was treated with an IV bolus dose of 6 mg mephenteramine.
- Bradycardia, defined as pulse rate < 50 beats per minute, was treated with a bolus dose of 0.6 mg IV atropine/glycopyrrolate.
- Post operatively, regression of the sensory blockade and total duration of sensory blockade were noted.
- Post operative analgesia was documented in terms of VAS score[3].

0 = no pain
1-2= Mild pain
3-7= Moderate pain
>7= Severe pain
10 = Maximum pain



STATISTICALANALYSIS

Data was be collected, compiled and tabulated. The statistical analysis was done by using parametric test and final interpretation by using 'Z' test (standard normal variant) with 95% significance.

For qualitative data, Pearson's Chi square test or Mann Whitney's U test was used, as applicable. And for quantitative data, Student's t test was used to draw inference.

Readings noted were -
T0: Time of sub arachanoid block
S1: Onset of sensory block
S: Max. sensory level reached
S2: Time taken to reach max sensory level
S3: Time of regression of sensory block to T10
S4: Total duration of sensory block
M1: Onset of motor block
M2: Time to reach complete motor block (Bromage-III level)
P1: Assessment of pain 15 minutes post-operatively (VAS score)
P2: Assessment of pain 30 minutes post-operatively (VAS score)

OBSERVATION AND RESULTS

Table 1: Test for Normality for various parameters.

Variable	Group	Shapiro-Wilk		
		Statistic	Df	Sig.
Pulse	Fentanyl	.958	30	.268
	Tramadol	.230	30	.060
SBP	Fentanyl	.971	30	.577
	Tramadol	.977	30	.752
DBP	Fentanyl	.933	30	.060
	Tramadol	.978	30	.759
MAP	Fentanyl	.923	30	.082
	Tramadol	.972	30	.581
SPO2	Fentanyl	.275	30	.062
	Tramadol	.404	30	.071
RR	Fentanyl	.729	30	.064
	Tramadol	.850	30	.063

Patients in Group **'T'** received Inj. Bupivacaine 0.5% hyperbaric 3.0 ml (15mg) + Inj. Tramadol 0.5ml (25mg) intrathecally.

Patients in Group **'F'** received Inj. Bupivacaine 0.5% hyperbaric 3.0 ml (15mg) + Inj. Fentanyl 0.5ml (25mcg) intrathecally.

Table 2: Comparison of age in study groups

Parameter	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Age (Years)	46.87	9.56	43.10	8.24	1.634	.108

Figure 1: Bar diagram showing comparison of age in study groups

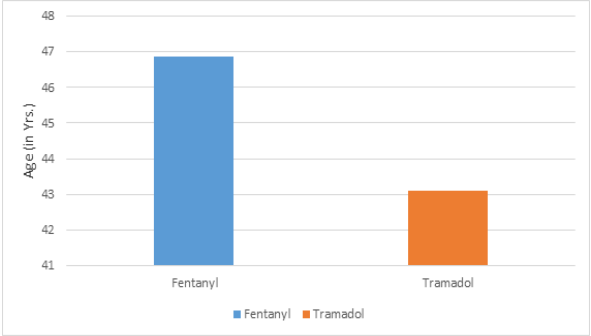


Table no. 2 and Figure 1 show age wise distribution of cases in study groups. Mean age in group T was 46.87 (S.D. ± 9.56) and in group F was 43.10 (S.D. ± 8.24). This was statistically not significant (p > 0.05).

Table 3: Gender wise distribution of cases in study groups

Gender	Group Fentanyl (n=30)	Group Tramadol (n=30)	Total (%)
Male	17 (56.70 %)	15 (50 %)	32 (53.30 %)
Female	13 (43.40 %)	15 (50 %)	28 (46.70 %)
Total	30	30	60 (100 %)

Figure 2: Bar diagram showing gender wise distribution of cases in study groups

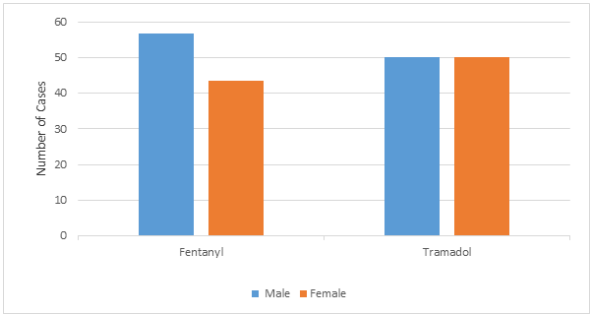


Table no. 3 and Figure 2 show gender distribution of cases in the study groups. Out of total 60 cases, maximum number were males 32 (53.30%) and remaining 28 (46.70%) were females. Within group comparison showed that number of males were more in group F than compared to group T where both male and females were equal in number.

Table 4: Comparison of weight in study groups

Parameters	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Weight (kg)	60.67	7.50	62.93	9.90	-.999	0.322

Figure 3: Bar diagram showing comparison of weight in study groups

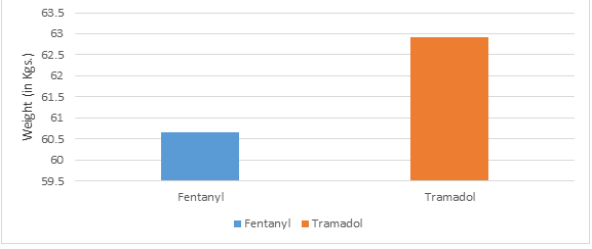


Table no. 4 and Figure 3 show comparison of weight (in Kg) in the two study groups. Mean weight in group F was 60.67 (S.D. ± 7.50) and in group T was 62.93 (S. D. ± 9.90). Mean weight within the groups was analyzed quantitatively and t value was –0.999 which was statistically not significant (p > 0.05).

Table 5: ASA grade wise distribution of cases in study groups

ASA grade	Group Fentanyl (n=30)	Group Tramadol (n=30)	Total (%)	Pearson Chi-Square	P Value
I	20 (66.7%)	23 (76.7%)	43 (71.7)	.739	0.567
II	10 (33.3%)	7 (23.3%)	17 (28.3)		
Total	30	30	60		

Figure 4: Bar diagram showing ASA grade wise distribution of cases in study groups

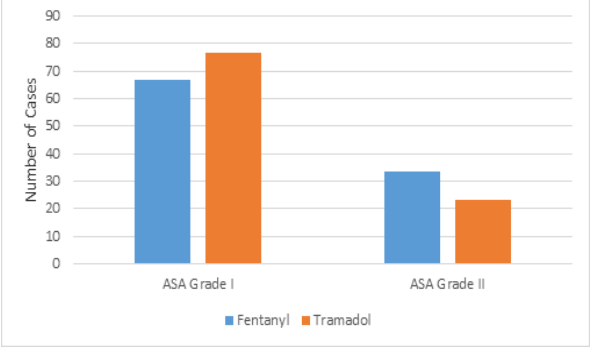


Table no. 5 and Figure 4 show ASA grade wise distribution of cases in the two study groups. Out of 60 cases, total 43 (71.7%) were ASA grade I and total 17 (28.3%) were ASA grade II. Within group comparison shows that group F had 20 (66.7%) ASA grade I and 10 (33.3%) ASA grade II cases, while group T had 23 (76.7%) ASA grade I and 7 (23.3%) ASA grade II cases.

Table 6: Comparison of Pulse rate in study groups

Pulse Rate (beats/min)	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Before induction (T0)	72.90	8.77	78.43	9.19	-2.384	.020
At 1 min	78.03	7.43	83.87	10.24	-2.525	.014
At 2 min	76.90	6.20	90.67	9.44	-6.678	.001
At 5 min	73.67	4.82	83.47	8.75	-5.371	.001
At 10 min	70.33	3.82	76.23	6.19	-4.443	.001
At 15 min	67.93	3.84	80.17	7.69	-7.796	.001
At 30 min	63.70	4.53	77.03	7.34	-8.467	.001

Figure 5: Bar diagram showing comparison of Pulse rate in study groups

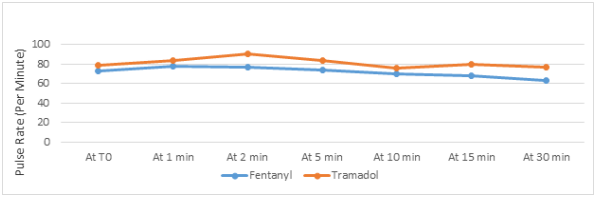


Table no. 6 and Figure 5 show comparison of pulse rate at different time intervals and was compared using independent sample t test that showed statistically significant difference between the two groups during all time intervals ($p < 0.05$).

Table 7: Comparison of SBP in study groups

SBP (mm of Hg)	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Before induction (T0)	116.83	9.01	121.27	9.27	-1.878	.020
At 1 min	109.27	7.51	113.00	9.95	-1.641	.014
At 2 min	108.87	5.47	101.93	7.47	4.099	.001
At 5 min	111.17	4.43	109.13	5.14	1.642	.106
At 10 min	113.27	5.20	113.80	5.18	-.398	.692
At 15 min	112.97	4.24	112.13	4.78	.714	.478
At 30 min	111.10	3.11	111.17	7.44	-.045	.964

Figure 6: Line diagram showing comparison of SBP in study groups

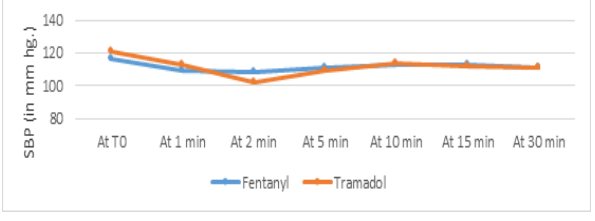


Table no. 7 and Figure 6 show comparison of systolic blood pressure at different time intervals which was compared using independent sample t test. Mean SBP in group F was 116.83 (S. D. ± 9.01) prior to induction which showed a decreasing trend till 2 minutes after induction i.e. 108.87 (S. D. ± 5.47) and then had a rising trend thereafter. Group T had a similar trend of fall in SBP from 121.27 (S. D. ± 9.27) before induction to 101.93 (S. D. ± 7.47) at 2 minutes followed by rise later. Mean SBP was statistically significant upto settling of the drug & fixation of level, with being highly significance at 2 minutes after induction, having a t value of 4.009 ($p < 0.01$) and statistically insignificant thereafter.

Table 8: Comparison of DBP in study groups

DBP (mm of Hg)	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Before induction (T0)	79.50	7.59	80.60	8.81	-.518	.606
At 1 min	74.63	6.23	70.77	7.40	2.192	.032
At 2 min	74.57	5.10	64.13	6.12	7.173	.001
At 5 min	71.50	4.34	68.33	5.04	2.606	.012
At 10 min	71.77	3.63	70.23	3.69	1.623	.110
At 15 min	70.30	2.69	69.13	3.31	1.498	.140
At 30 min	69.07	2.50	71.20	5.13	-2.047	.045

Figure 7: Line diagram showing comparison of DBP in study groups

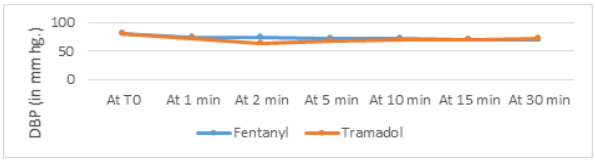


Table no. 8 and Figure 7 show comparison of diastolic blood pressure in both the groups using independent sample t test. Mean DBP in group F was 79.50 (S. D. ± 7.59) which showed a declining trend till 30 minutes after induction i.e. 69.07 (S. D. ± 2.50). In group T there was declining trend from 80.60 (S. D. ± 8.81) at induction to 64.13 (S. D. ± 6.12) at 2 minutes followed by rise upto 71.20 (S. D. 5.13) at 30 minutes. Mean DBP was statistically insignificant before induction ($p > 0.05$). It became statistically significant ($p < 0.05$) after induction upto settling of the drug & fixation of level till 5 minutes and then statistically insignificant ($p > 0.05$) again at 10 & 15 minutes time interval. It was statistically significant again at 30 minutes time interval ($p < 0.05$).

Table 9: Comparison of MAP in study groups

MAP (mm of Hg)	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Before induction (T0)	90.33	7.47	90.33	16.95	.000	1.000
At 1 min	84.73	6.57	84.90	6.92	-.096	.924
At 2 min	85.37	5.40	76.37	4.87	6.778	.001
At 5 min	84.40	3.81	81.60	3.38	3.011	.004
At 10 min	85.17	3.93	84.27	2.70	1.033	.306
At 15 min	84.13	2.27	83.40	2.56	1.172	.246
At 30 min	83.10	2.25	84.50	4.77	-1.454	.151

Figure 8: Line diagram showing comparison of MAP in study groups

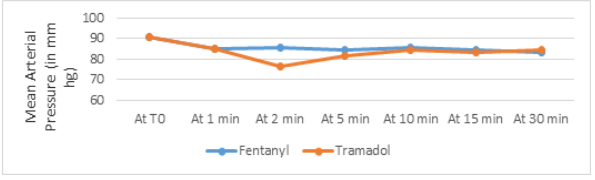


Table no. 9 and Figure 8 show comparison of mean blood pressure in both the groups using independent sample t test.

MAP in group F was 90.33 (S. D. ± 7.47) which showed a continuous declining trend till 83.10 (S. D. ± 2.25) at 30 minutes after induction. In group T, MAP was 90.33 (S. D. ± 16.5) before induction which had a declining trend till 2 minutes i.e. 76.37 (S. D. ± 4.87) and then showed a rise upto 84.50 ((S. D. ± 4.77) at 30 minutes time interval. Mean of MAP was statistically significant ($p < 0.05$) at 2 and 5 minute time interval till the drug got settled and the level got fixed and then became statistically insignificant ($P > 0.05$) thereafter.

Table 10: Comparison of SpO2 in study groups

SpO_2 (%)	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Before induction (T0)	99.50	.86	99.60	.77	-.474	.637
At 1 min	99.63	.67	99.57	.82	.346	.731
At 2 min	99.77	.50	99.57	.82	1.141	.259
At 5 min	99.87	.34	99.77	.50	.896	.374
At 10 min	99.87	.34	99.80	.48	.614	.542
At 15 min	99.90	.30	99.80	.61	.803	425
At 30 min	99.93	.25	99.87	.34	.851	.398

Figure 9: Line diagram showing comparison of SpO2 in study groups

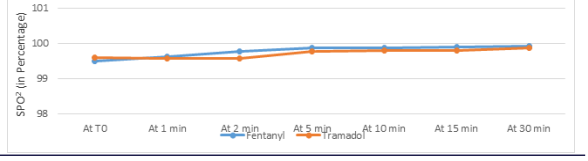


Table no. 10 and Figure 9 show a comparison of SpO2 at different time intervals using independent sample t test in both the study groups, which was not statistically significant ($p > 0.05$).

Table 11: Comparison of RR in study groups

RR (per min.)	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Before induction (T0)	15.57	.86	15.53	1.04	.135	.893
At 1 min	15.23	.77	16.17	1.34	-3.301	.002
At 2 min	15.10	.61	15.63	.72	-3.105	.003
At 5 min	14.90	.61	15.27	.69	-2.182	.033
At 10 min	14.57	.68	15.13	.73	-3.113	.003
At 15 min	14.77	.50	15.07	.64	-2.018	.048
At 30 min	14.70	.59	15.17	1.05	-2.112	.039

Figure 10: Line diagram showing comparison of RR in study groups

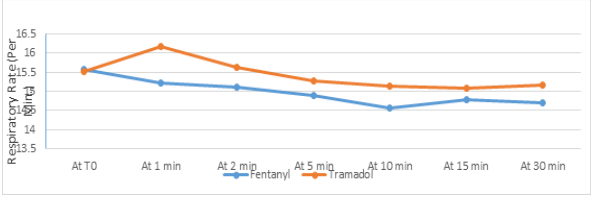


Table no. 11 and Figure 10 show comparison of respiratory rate at different time intervals in both the study groups. It was statistically insignificant before induction with a RR of 15.57 (S. D. ± 0.86) in group F and 15.53 (S. D. ± 1.04) in group T.

Thereafter the respiratory rate was consistently statistically significant ($p < 0.05$) in both the groups till 30 minutes post induction.

Table 12: Comparison of Modified Bromage scale in study groups

Modified Bromage score	Group Fentanyl (n=30)		Group Tramadol (n=30)		MW test Z Value	P Value
	Mean	SD	Mean	SD		
At 1 min	.67	.48	.43	.50	-1.801	.072
At 2 min	1.27	.45	1.13	.34	-1.280	.200
At 5 min	2.87	.34	2.53	.51	-2.794	.005
At 10 min	3.00	.00	3.00	.00	.000	1.000
At 15 min	3.00	.00	3.00	.00	.000	1.000
At 30 min	3.00	.00	3.00	.00	.000	1.000

Figure 11: Line diagram showing comparison of modified Bromage ScalE

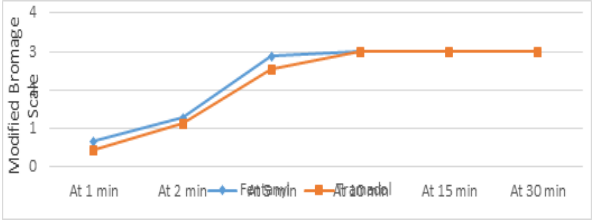


Table no. 12 and Figure 11 show comparison of Modified Bromage scale in both the study groups.

Mean score at 5 minutes post induction with a Z value of -2.794 was clinically significant ($p < 0.05$) Mean score of was statistically insignificant ($p > 0.05$) at all other time intervals of comparison upto 30 minutes post induction.

Table 13: Comparison of onset of sensory and motor block in study groups

Onset (min) of	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Sensory block (S1)	2.47	.57	2.67	.61	-1.315	.194
Motor block (M1)	4.57	.97	3.17	.59	6.740	.001

Figure 12: Bar diagram showing comparison of the onset of sensory and motor block

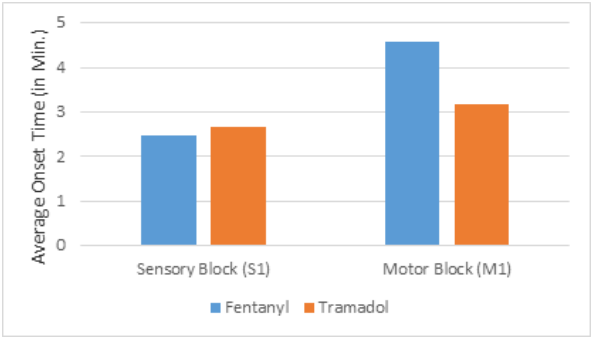


Table no. 13 and Figure 12 show comparison of onset and motor block in both the study groups.

In group F mean duration of onset of sensory block was 2.47 minutes (S. D. ± 0.57) and in group T it was 2.67 minutes (S. D. ± 0.61).

In group F mean duration of onset of motor block was 4.57 minutes (S. D. ± 0.97) and I group T it was 3.17 minutes (S. D. ± 0.59).

Both the values were assessed using independent sample t test. The t value for sensory block was statistically insignificant ($p > 0.05$) whereas the t value for motor block was highly significant ($p < 0.001$).

Table 14: Maximum Sensory level reached (S)

S	Group Fentanyl (n=30)		Group Tramadol (n=30)		MW test Z Value	P Value
	Mean	SD	Mean	SD		
Mean Score	6.33	0.66	6.60	0.77	-1.562	.118

Figure 13: Bar diagram showing comparison of the maximum sensory level reached

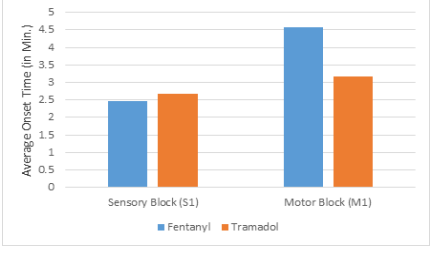


Table no. 14 and Figure 13 show the comparison of maximum level of sensory block reached corresponding to the dermatomes.

The values were assessed using Man Whitney's U test. The mean value for maximum sensory level reached in group F was 6.33 (S. D. ± 0.66) whereas in group T was 6.60 (S. D. ± 0.77).

The Z value of comparison was calculated to be -1.56, which is found to be statistically insignificant ($p > 0.05$)

Table 15: S_2: Time taken to reach max sensory level

S_2	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Duration (min)	3.57	.73	3.63	.61	-.383	.703

Figure 14: Bar diagram showing comparison of the time taken to reach max sensory level

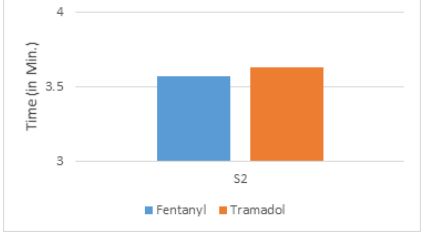


Table no. 15 and Figure 14 show comparison of the time taken to reach the maximum dermatome level of sensory blockade.

In group F the mean value of time taken to reach maximum sensory level was 3.57 minutes (S. D. ± 0.73) whereas in group T it was 3.63 minutes (S. D. ± 0.61).

The t value calculated for comparison among the two groups was found to be statistically insignificant ($p > 0.05$)

Table 16: M_2: Time to reach complete motor block (Bromage-III level)

M_2	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Duration (min)	4.80	.76	3.83	.64	5.298	.001

Figure 15: Bar diagram showing comparison of Time to reach complete motor block

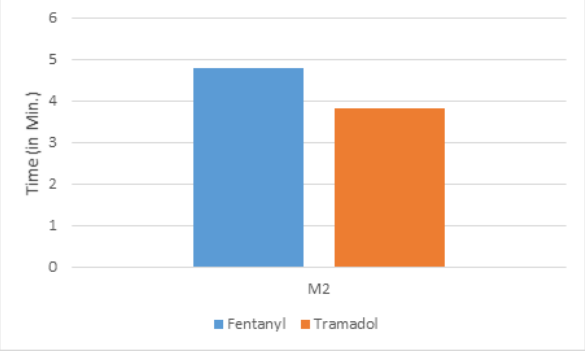


Table no. 16 and Figure 15 show comparison of time taken to reach complete motor blockade (Bromage III level) in both the groups.

In group F the mean value of time taken to reach complete motor blockade was 4.80 minutes (S. D. ± 0.76) whereas in group T it was 3.83 minutes (S. D. ± 0.64).

The t value calculated for comparison of the two groups was found to be highly statistically significant ($p < 0.001$).

Table 17: S_3: Time of 2 segment regression of sensory block

S3	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Duration (min)	128.93	10.02	129.17	9.48	-.093	.926

Figure 16: Bar diagram showing comparison of the time for 2 segment regression of sensory block

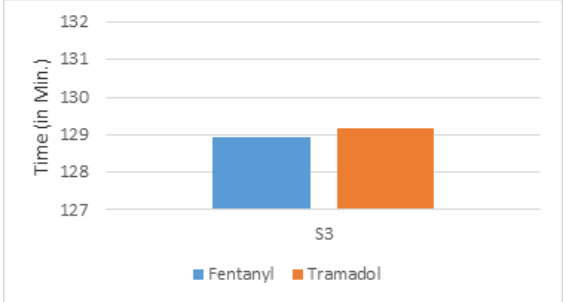


Table no. 17 and Figure 16 show comparison of time taken from induction, for the sensory blockade to regress by 2 segments, in both the study groups.

In group F the mean duration of time for sensory block regression was 128.93 minutes (S. D. ± 10.01) whereas in group T it was 129.17 minutes (S. D. ± 9.48).

The comparison of two was done by using independent sample t test and calculated as t value of -0.093, which was statistically insignificant.

Table 18: S_4: Total duration of sensory block

S_4	Group Fentanyl (n=30)		Group Tramadol (n=30)		t Value	P Value
	Mean	SD	Mean	SD		
Duration (min)	345.00	17.17	309.33	11.27	9.510	.001

Figure 17: Bar diagram showing comparison of the total duration of sensory block

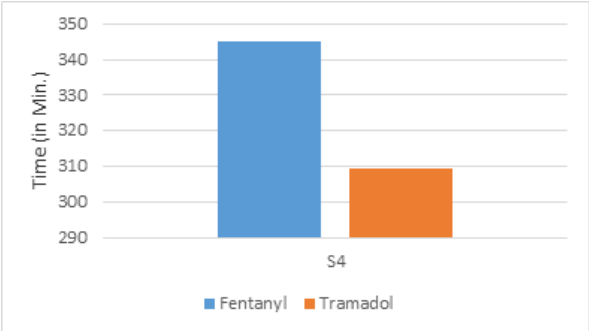


Table no. 18 and Figure 17 show comparison of duration, from induction, till which the sensory block lasted in both the study groups.

In group F the mean value of total duration of sensory block was 345.00 minutes (S. D. ± 17.17) whereas in group T it was 309.33 minutes (S. D. ± 11.27).

The comparison of two was done by using independent sample t test and the t value calculated was statistically highly significant ($p < 0.001$).

Table 19: Assessment of pain 15 minutes post-operatively (VAS score)

P_1	Group Fentanyl (n=30)	Group Tramadol (n=30)	Total (%)	Pearson Chi-Square	P Value
0	28 (93.3)	25 (83.3)	53 (88.3)	1.456	.424
1	2 (6.7)	5 (16.7)	7 (11.7)		
Total	30	30	60		

Figure 18: Pie charts showing comparison of VAS scores 15 minutes post operatively

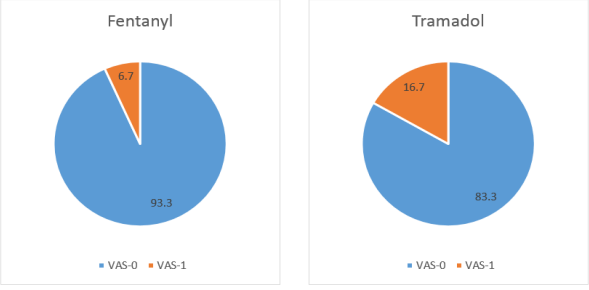


Table no. 19 and Figure 18 show comparison of pain perception at 15 minutes after the end of surgery in both the groups, as a score, assessed by using Visual Analogue Scale.

In group F, at 15 minutes, 28 patients (93.3%) had a score of 0 on Visual Analogue Scale whereas 2 patients (6.7%) had a score of 1.

Similarly in group T, at 15 minutes, 25 patients (83.3%) had a score of 0 on Visual Analogue Scale whereas 7 patients (11.7%) had a score of 1.

It was compared qualitatively using Pearson Chi Square test which calculated a value of 1.456 that was statistically insignificant.

Table 20: Assessment of pain 30 minutes post-operatively (VAS score)

P_2	Group Fentanyl (n=30)	Group Tramadol (n=30)	Total (%)	Pearson Chi-Square	P Value
0	26 (86.7)	21 (70)	47 (78.3)	3.350	.187
1	4 (13.3)	7 (23.3)	11(18.3)		
2	0 (0)	2	2 (6.7)		
Total	30	30	60		

Figure 19: Pie charts showing comparison of VAS scores 30 minutes post operatively

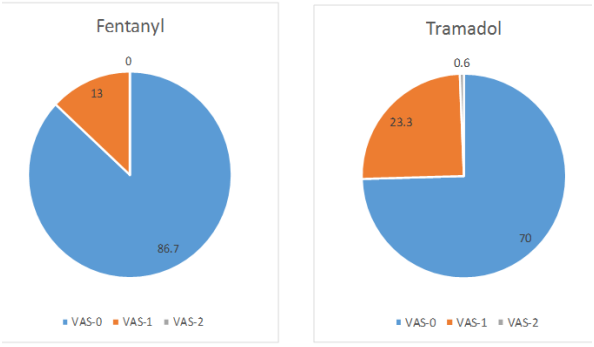


Table no. 20 and Figure 19 show comparison of pain perception at 30 minutes after the end of surgery in both the groups, as a score, assessed by using Visual Analogue Scale.

In group F, at 30 minutes, 26 patients (86.7%) had a score of 0 on Visual Analogue Scale whereas 4 patients (13.3%) had a score of 1 and none (0%) had a score of 2.

Similarly in group T, at 30 minutes, 21 patients (70%) had a score of 0 on Visual Analogue Scale whereas 7 patients (23.3%) had a score of 1 and 2 patients (6.7%) had a score of 2.

It was compared qualitatively using Pearson Chi Square test which calculated a value of 3.350 that was statistically insignificant.

Table 21: Comparison of side effects in the study groups

Adverse Effects	Group		Total	Pearson Chi-Square	P Value
	Fentanyl	Tramadol			
No Adverse Effects	30 (100)	23 (38.3)	53 (88.3)	7.925	.048
Nausea	0 (0)	4 (6.7)	4 (6.7)		
Vomiting	0(0)	1 (1.7)	1 (1.7)		
Hypotension	0(0)	2 (3.3)	2 (3.3)		
Total	**30(100)**	**30(100)**	**60(100)**		

Figure 20: Bar diagram showing comparison of the incidence of adverse/side effects

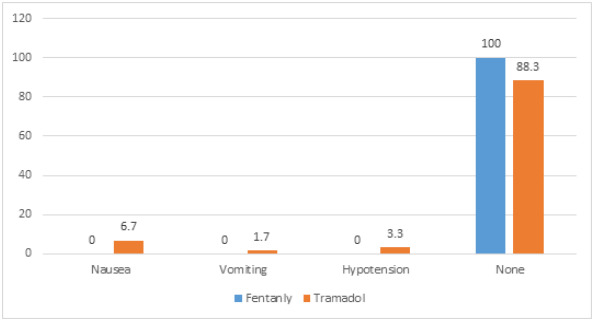


Figure 21: Pie charts showing the incidence of adverse/side effects

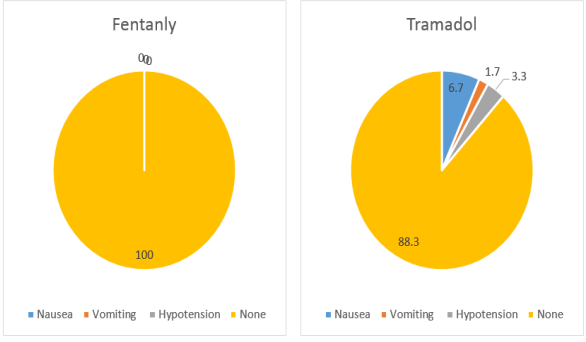


Table no. 21 and figures 20 and 21 show the comparison of incidences of side/adverse effects observed during the surgery in the two study groups.

No adverse effects were seen in any patient in the Fentanyl group, whereas out of 30 patients in tramadol group, 4 patients had complain of nausea, 1 patient had an episode of vomiting and 2 patients had an episode of hypotension during the surgery.

Pearson Chi-Square test was used to compare these incidences and the value came out to be 7.925 which was statistically significant ($p < 0.05$).

DISCUSSION

Neuraxial subarachnoid block with local anaesthetic agents has been most extensively used for lower abdominal and lower limb surgeries because of its simplicity, speed, efficacy and reliability. It attenuates the surgical stress response and provides both intra-operative and post-operative pain relief. The intrathecal local anaesthetic acts by inhibiting voltage gated sodium ion channels in the spinal cord that interferes with both the afferent and efferent sensory and motor nerve conduction[4]. But bupivacaine alone is not capable of extending the analgesic effects in post operative period for long because of its short duration of action.

Surgical incision leads to cellular disruption and consequent intracellular release of mediators like phospholipids and results in a state of widespread inflammation depending on the degree of surgical trauma. A vast number of chemical mediators such as prostanoids, bradykinin and nerve growth factor are released during the peri-operative period. These mediators lead to central pain sensitization, impelling the use of a variety of pharmacological agents to treat postoperative pain.

Uncontrolled pain may produce a range of detrimental acute and chronic effects. Reduction of nociceptive trigger to the CNS and optimization of peri-operative analgesia may decrease the incidence of adverse events and facilitate recovery during the immediate post-operative period[5].

To further polish the quality of the spinal anesthesia and extend post operative pain relief, addition of opioids (such as morphine, fentanyl sufentanil and tramadol) and other drugs (such as dexmedetomidine, clonidine, magnesium sulfate (MgSO4), neostigmine, ketamine, and midazolam) have been tried. This enriched technique of adding adjuvants to local anaesthetics is simple and fascinating and has gained a worldwide acceptability by anaesthesiologists.

Addition of opioids to local anaesthetic agent for spinal anaesthesia was first introduced in clinical practice in 1979 with intrathecal morphine as a forerunner. Animal studies have also demonstrated antinociceptive synergism between intrathecal opioids and local anaesthetics when they act upon the nervous system.

Fentanyl, a lipophilic opioid, has rapid onset of action following intra thecal administration. It acts by binding to the specific opioid receptors and lead to their activation, inhibiting the presynaptic release and postsynaptic response to excitatory neurotransmitters. It interrupts the transmission of action potentials carrying pain impulses in the dorsal horn of spinal cord[6].

In the central nervous system, analgesic action of tramadol occurs by two distinct mechanisms. It binds to the opioid receptors weakly and also inhibits the reuptake of norepinephrine and serotonin in the spinal cord. It is a synthetic 4-phenyl-piperidine analogue of codeine. It stimulates the μ-receptor and, to a lesser extent, the δ- and κ-opioid receptors. It also activates the mono aminergic receptors of the descending neuraxial inhibiting pain pathway. The elimination half life of tramadol is 5.5 hours and provides clinical analgesia for 4-6 hours after parenteral administration and for 10 hours after its epidural administration.

In this study, we aimed to find out whether quality of anaesthesia is better with bupivacaine and fentanyl or with bupivacaine and tramadol. The present study was carried out to compare the onset, quality and duration of sensory and motor blockade produced with fentanyl (25mcg) vs tramadol (25mg) when added to 0.5% hyperbaric bupivacaine (15mg).

Monitoring of the pulse rate, blood pressure (SBP, DBP and MBP), oxygen saturation (SpO_2) and respiratory rate was done throughout the surgery. Onset of sensory block was assessed using pin prick method

and onset and quality of motor block was assessed using modified Bromage scale. Duration of analgesia was assessed using visual analogue scale.

Demographic profile

The differences in the patient's age, gender, weight and ASA status between the groups were statistically insignificant.

The age wise distribution of cases in our study group in **table no. 2 & figure 1** showed mean age in group F was 46.87 (S.D. ± 9.56) and in group T was 43.10 (S.D. ± 8.24), which was statistically not significant ($p > 0.05$).

The gender wise distribution of cases in the study group in **table no. 3 & figure 2** showed that, out of total 60 cases maximum number were of males 32 (53.30%) and remaining 28 (46.70%) were females. Within group comparison showed that number of males were more in group F than compared to group T and number of female were more in group T than group F.

The comparison of weight (kg) in the study group in **table no. 4 & figure 3** showed that, mean weight in group F was 60.67 (S.D. ± 7.50) and in group T was 62.93 (S.D. ± 99.90), which was statistically not significant with ($p > 0.05$).

The ASA grade wise distribution of cases in study group in **table no. 5 & figure 4** showed that, out of 60 cases 43 (71.70%) were in ASA grade I and 17 (28.30%) were in ASA Grade II. Between the group comparison shows that Group F as well as Group T had more number of cases under grade ASA-I.

Hemodynamic parameters -

Comparison of pulse rate in **table no. 6 & figure 5** at different time intervals using independent 't' test showed significant statistical difference between the two groups at all time intervals ($p > 0.05$).

Table no.7, 8 and 9 & corresponding figures 6, 7 and 8 of our study show the comparison of systolic blood pressure, diastolic blood pressure and mean blood pressure at different time intervals. They were statistically compared using independent 't' test. There was progressive decline in SBP, in both the groups till 2 minutes i.e.in group F fall in blood pressure was from 116.83 to 108.87 at 2 minutes post induction and in group T fall was from 121.27 to 101.93. This fall in BP was statistically significant ($p < 0.05$) till 2 minutes and then it increased and became statistically insignificant ($p > 0.05$) between both the groups thereafter. Similar trend of findings were seen with respect to DBP and MAP at the mark of 5 minutes post induction in both the groups.

Comparison of SpO_2 in **table no. 10 & figure 9** at different time intervals using independent 't' test was not statistically significant ($p > 0.05$).

Comparison of respiratory rate in **table no. 11 & figure 10** at different intervals of both the study groups was not statistically significant ($p = 0.893$) before induction but was statistically significant ($p < 0.05$) throughout at all time intervals post induction. Even though it was shown to be statistically significant, it was not significant clinically.

Table 12 & figure 11 of our study show the comparison of modified Bromage scale of both the groups. Comparison was done using Mann Whitney test and the Z value for the mean of score on Bromage scale for the two study groups was -1.801 and -1.280 at 1 minute and 2 minute after induction, respectively, both of which were statistically insignificant ($p > 0.05$). Though the Z value for the same comparison at 5 minutes was -2.794 which was statistically significant ($p < 0.05$). At all the other time intervals, 10, 15 & 30 minutes after induction, the Z value was 0.000 which were statistically insignificant ($p > 0.05$).

Table 13 & figure 12 of our study show comparison of onset of sensory (S_1) and motor (M_1) block in both the groups. In group F, mean duration for onset of sensory block was 2.47 minutes (SD ± 0.57) and in group T, it was 2.67 minutes (SD ± 0.61). In group F, mean duration for onset of motor block was 4.57 minutes (SD ± 0.97) and in group T it was 3.17 minutes (SD ± 0.59). Both the values were clinically assessed by independent sample 't' test. The p value for onset of sensory block was found to be statistically insignificant ($p = 0.194$) whereas for onset of motor blockade it was highly significant statistically ($p < 0.001$).

Singh AP[7] in 2015, conducted study on "A comparative study of intrathecal bupivacaine with bupivacaine-tramadol and bupivacaine-fentanyl for post operative pain relief in lower abdominal and lower limb surgeries"3. 90 patients were given either of the three sets of intrathecal drugs randomly so the each group comprised 30 patients. Group A – bupivacaine HCL 15 mg (3ml) 0.5% heavy Group B – bupivacaine HCL 15 mg (3ml) 0.5% heavy and tramadol HCL 25 mg (0.5ml) Group C – bupivacaine HCL 15 mg (3ml) 0.5% heavy and Fentanyl citrate 25 µg (0.5ml). Our findings were comparable to his findings where he found that the mean time of onset of sensory block seen in different groups was found to be lesser in Fentanyl group (C) than Tramadol group (B). Similarly the mean time of onset of motor block was (254 ± 49.22), (250 ± 44.45), (267.3 ± 42.88) seconds in Group A, B and C respectively that matches with findings of our study with tramadol group showing early onset of motor blockade.

Table no. 14 & figure 13 show comparison of the maximum dermatome level of sensory blockade (S) achieved by the drug combinations in the two study groups. Mann Whitney's U test was used to deduce the Z value (-1.562) for comparison of mean values which was found to be statistically insignificant ($p > 0.05$). This comparison was both statistically as well clinically insignificant as the maximum dermatome level of sensory blockade achieved by both the drug combinations was upto T7 or T6, in all the patients.

Table no. 15 & figure 14 show comparison of the mean values of time taken to reach the maximum dermatome level of sensory blockade (S_2), i.e. Bromage-III, in both the study groups. The t value calculated for both the means was 5.298 which was statistically highly significant ($p < 0.001$).

Table no. 16 & figure 15 show comparison of the mean values of time taken to reach the maximum level of motor blockade (M_2) in both the study groups. The t value calculated for both the means was -0.383 which was statistically insignificant ($p > 0.05$).

Table 17 & figure 16 of our study show comparison of time for 2 segment regression of sensory block (S_3) in both the study groups. In group F mean duration of 2 segment regression of sensory block was 128.93 minutes (SD ± 10.02) and in group T it was 129.17 minutes (SD ± 9.48). Both the values were clinically assessed using Z test and found to be very highly significant with Z value of 7.42 ($p < 0.001$) for sensory regression.

Table 18 & figure 17 of our study show the comparison of total duration of sensory blockade (S_4) in both the groups.

In group F, the mean of total duration of sensory blockade was 345 minutes (SD ± 17.17) and in group T it was 309.33 minutes (SD ± 11.27). The t value was clinically assessed using independent sample „t" test and found to be 9.510 which is highly significant statistically. Mean duration of analgesia was more for group F as compared to group T.

Afolavan JM[8] et al in 2014 conducted a study on "Intrathecal tramadol versus intrathecal fentanyl for visceral pain control during bupivacaine subarachnoid block for open appendicectomy"1 in which they found the total duration of analgesia to be significantly longer in patients receiving fentanyl as adjuvant to bupivacaine compared to those receiving tramadol as the adjuvant.

Table no. 19 & figure 18 show comparison of the assessment of pain as a score on Visual Analogue Scale, between the two groups 15 minutes post operatively (P_1) . Pearson's Chi square test was used to calculate and compare the number of patients having any score from 0 to 10 on VAS. The value came out to be 1.456 which was statistically insignificant ($p > 0.05$).

Table no. 20 & figure 19 show comparison of the assessment of pain as a score on Visual Analogue Scale, between the two groups 30 minutes post operatively (P_2). Pearson's Chi square test was used and the value came out to be 3.350 which was statistically insignificant ($p > 0.05$).

Chakraborty S, Chakrabarti J and Bhattacharya D[9] in 2008 conducted a study on "Intrathecal tramadol added to bupivacaine as spinal anesthetic increases analgesic effect of the spinal blockade after major gynecological surgeries"2 in which they found the VAS score was significantly lower in patients who were given tramadol as

adjuvant than those who were given normal saline concurrently.

Table no. 21 & figure 20 and 21 show comparison of the incidence of adverse/side effects because of the drugs under evaluation, that occurred any time through the surgery, in the two groups. None of the patients in fentanyl had any side effects throughout the surgery while 6 out of 30 patients in tramadol group faced adverse effects which included nausea, vomiting and hypotension. Pearson Chi-Square test was used to compare these incidences and were found to be statistically significant ($p < 0.05$).

CONCLUSION

Patients in two groups could be compared with regards to age, weight, gender and ASA physical status.

Sensory blockade started early in fentanyl group, whereas the onset of motor block was early in tramadol group. The highest level of sensory blockade reached in both the groups was T6. Time taken to reach the maximum level of sensory block was more in tramadol group, whereas the time taken to reach maximum motor blockade (Bromage-III) was more in fentanyl group. Two segment regression started early in fentanyl group compared to tramadol group but the total duration of sensory block was prolonged and was significantly more in fentanyl group. Majority patients had a VAS score of 0 at 15 and 30 minutes post operatively. Among those few with VAS score of 1 & 2 at 15 & 30 minutes, the number was more among the tramadol group compared to fentanyl group. No adverse effects were noted throughout the surgery in fentanyl group whereas 6 patients out of 30 had complains of nausea, vomiting or hypotension in the tramadol group.

Early onset, adequate level and prolongation of the duration of both sensory and motor block, prolonged duration of analgesia and intra operative hemodynamic stability were observed with the introduction of both the adjuvants to 0.5% (heavy) bupivacaine but Fentanyl stands an undisputed forerunner to tramadol due to its superior anaesthetic and analgesic properties combined with minimal side effects and the incidence of side effects were also found more with tramadol as compared to fentanyl.

REFERENCES

1. Afolavan JM et al. Intrathecal tramadol versus intrathecal fentanyl for visceral pain control during bupivacaine subarachnoid block for open appendicectomy.2014; 17(3):324-330
2. Chakraborty S et al. Intrathecal tramadol added to bupivacaine as spinal anaesthetic increases analgesic effect of the spinal blockade after major gynecological surgeries. Indian J Pharmacol. 2008;40(4):180-182
3. Singh AP. A comparative study of intrathecal bupivacaine with bupivacaine-tramadol and bupivacaine-fentanyl for post operative pain relief in lower abdominal and lower limb surgeries. Int J Pharm Bio Sci 2015;6(4): 752-758
4. Collins, Vincent J. principles of Anaesthesiology 3rd edition.USA:Lea and Febiger publishing p 1498-1520
5. Cung D, Lee YJ, Hyun Jo M, Park HJ, Lim GW, Cho H, et al. The ON-Q pain management system in elective gynecology oncologic surgery: Management of post operative surgical site pain compared to intravenous patient controlled analgesia. Obstetrics & gynecological science 2013;56(2):93-101
6. Butterworth JF et al. Molecular mechanisms of local anaesthesia:A review. Anaesthesiology 1990;72:711-734
7. Wu CL. Acute postoperative pain.6 ed. Chapter 72. In: Miller's Anaesthesia. Miller RD, ed. Elsevier Churchill Livingstone; Philadelphia; 2005. pp. 2730-2731
8. Khangure N. Week 230: Anaesthesia tutorial of the week. Adjuvant agents in neuraxial blockade. 2011; 4:1-10
9. Wylie, Churchill-Davidson's. A practice of Anaesthesia 5th edition. Singapore: P G publishing p 856-857