

**A study to assess the hemodynamic variables of prophylactic dose of ketamin and ondansetron versus tramadol and ondansatron for prevention of shivering during spinal anaesthesia - A comparative observational study.**

<sup>1</sup>Dr. Maroti Gaikwad, Head of Department & Professor, Anaesthesia, PCMC'S PGI YCMH PIMPRI, PUNE-18

<sup>2</sup>Dr. Beena Jain, Post Graduate Resident, Anaesthesia, PCMC'S PGI YCMH PIMPRI, PUNE-18

**Corresponding Author:** Dr. Beena Jain, Post Graduate Resident, Anaesthesia, PCMC'S PGI YCMH PIMPRI, PUNE-18

**How to citation this article:** Dr. Maroti Gaikwad, Dr. Beena Jain, "A study to assess the hemodynamic variables of prophylactic dose of ketamin and ondansetron versus tramadol and ondansatron for prevention of shivering during spinal anaesthesia - A comparative observational study", IJMACR- May - 2023, Volume – 6, Issue - 3, P. No. 387 – 394.

**Open Access Article:** © 2023, Dr. Beena Jain, et al. This is an open access journal and article distributed under the terms of the creative commons attribution license (<http://creativecommons.org/licenses/by/4.0>). Which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**Type of Publication:** Original Research Article

**Conflicts of Interest:** Nil

**Abstract**

**Objective:** To assess the hemodynamic variables of prophylactic dose of ketamin and ondansetron versus tramadol and ondansatron for prevention of shivering during spinal anaesthesia

**Materials and Method:** A prospective observational hospital-based study conducted on patients posted for elective cases under spinal anesthesia. SA was instituted using 0.5% isobaric bupivacaine of dose depending on patients height and weight. Just after SA, patients were divided to one of the following two study groups: group K = ketamine (0.2mg/kg IV) and ondansetron (4mg), group T= tramadol (0.5mg/kg IV) and ondansatron (4 mg) group. Hemodynamic variables such as HR, mean arterial pressure and oxygen saturation (SPO2) using pulse oximetry were recorded every 5 minutes intra operatively and every 10 minutes postoperatively for 1 hour.

**Result:** The mean age in group K was 35.84 years and group T was 36.02 years. Out of total 124 patients, there were 37 (59.67%) and 36 (58.06%) male patients among Group K and Group T respectively. Mean systolic blood pressure in Group K and Group T was 128.32±11.12 and 126.38±10.36 mm of Hg respectively. Mean diastolic blood pressure in Group K and Group T was 78.73±5.18 and 79.84±5.43 mm of Hg respectively. Mean O2 saturation in Group K and Group T was 98.68±5.28 and 98.76±5.3 % respectively. Mean arterial pressure in Group K and Group T was 94.25 ±4.57 and 95.41 ± 3.76 mm of Hg respectively.

**Conclusion:** The findings of present study concludes that the mean intra-operative heart rate, mean intra-operative systolic, diastolic and arterial blood pressure, mean SPO2 among patients from Group K compared to Group T at different time intervals shows no statistical significance.

**Keywords:** spinal anaesthesia, hemodynamic variables, prophylactic dose, shivering.

### **Introduction**

Spinal anesthesia is one of the most popular and safe techniques used for various surgeries. A common problem that develops following spinal anesthesia is shivering. This problem is seen in up to 57% of patients receiving spinal anesthesia.(1,2)

Intraoperative Shivering is a common and distressing complication following spinal anesthesia. The prolonged impairment of thermoregulatory autonomic control under anesthesia along with cold infusion fluids contributes to a fall in core body temperature and hence causes shivering.(3)

Other possible factors can be loss of thermoregulatory vasoconstriction below the level of the blocking region, resulting in increased heat loss from the body surface, redistribution of body heat from the center to the periphery (4) and altered thermoregulation because of an increased sweating threshold and decreased Vaso constriction.(5)

Post anesthesia shivering is very uncomfortable for patients. It is associated with a number of potentially deleterious sequelae such as increased oxygen consumption and an increase in metabolic rate by up to 600%. (6) It leads to catecholamine release and sympathetic stimulation. This increases cardiac output, heart rate and blood pressure and is detrimental to patients with low cardiorespiratory reserve. Ketamine has been discovered to be an effective shivering preventative and treatment because it is a competitive N-Methyl-D-Aspartate (NMDA) receptor antagonist.(7)

Due to direct central sympathetic stimulation, suppression of norepinephrine uptake into post ganglionic sympathetic nerve endings, and possible reduction in

core-to-peripheral heat redistribution, it elevates arterial pressure, heart rate, and cardiac output. Ketamine use may therefore make sense for individuals who are at risk of hypothermia.(8) Post-spinal shivering can be prevented with the help of tramadol, a centrally acting analgesic with  $\mu$ -opioid agonist actions and minimal effect at kappa and delta receptors. It is hypothesized that the mechanism of action resets the body's temperature regulation center by reducing noradrenaline and serotonin neuronal absorption in the spinal cord and increasing the release of hydroxyl tryptamine through its modulatory influence on central monoaminergic pathways. (9) Ondansetron is 5HT<sub>3</sub> receptor antagonist, primarily used to prevent emesis. Recently it has also been tried successfully for prevention of shivering in dose of 8mg IV without any side effects.(10)

This study was designed to assess the hemodynamic variables of low dose ketamin and ondansetron with tramadol and ondansatron for prevention of shivering during spinal anesthesia.

### **Materials and Method**

- Study design: A prospective observational hospital-based study.
- Study population: Patients posted for elective cases under spinal anesthesia.
- Study duration: 18 months from January-2021 to July-2022

### **Inclusion criteria**

- Patients between the ages of 18 and 65
- Both genders
- Undergoing elective surgeries requiring Spinal Anaesthesia
- ASA (American Society of Anaesthesiologist) physical status I, II

### Exclusion criteria

- A history of bupivacaine, ketamine, or opioid hypersensitivity
- Cardio vascular illness, high blood pressure, schizophrenia, antepartum haemorrhage, cord prolapse, and foetal discomfort in the past
- Initial temperature  $>38^{\circ}\text{C}$  or  $<36^{\circ}\text{C}$
- History of alcohol or substance abuse
- Failed spinal converted to general anaesthesia.

### Methodology

- In present study patients posted for elective cases under spinal anesthesia was randomly allocated into two groups:
- Ketamine group [K]: ketamine (0.2mg/kg IV) and ondansetron(4mg)
- Tramadol Group [T]: tramadol (0.5mg/kg IV) and ondansatron(4mg) group

### Procedure

Written informed consent was taken from 124 American Society of Anesthesiologist (ASA) I, II grade patients aged 18-65 years, who were planned for various surgeries under SA after detailed explanation about the study.

- Before SA, IV fluids was administered through 20G IV cath. Room temperature through skin probe, and hemodynamic variables (blood pressure, HR and oxygen saturation [SPO<sub>2</sub>]) will be recorded
- SA was instituted at either L2–L3 or L3–L4 in the sitting position by the anaesthesiologist using 25, 26gauge Quincke spinal needles, and 0.5% isobaric bupivacaine of dose depending on patients height and weight.
- Just after SA, patients were divided to one of the following two study groups: group K = ketamine

(0.2mg/kg IV) and ondansetron (4mg) group T = tramadol (0.5mg/kg IV) and ondansetron (4mg) group

- Hemodynamic variables such as HR, mean arterial pressure and oxygen saturation SPO<sub>2</sub> using pulse oximetry was recorded every 5 minutes intraoperatively and every 10 minutes postoperatively for 1 hour.

### Result

- The mean age in group K was 35.84 years and group T was 36.02 years. There was no significant difference in age distribution in all two groups. ( $p>0.05$ )
- Out of total 124 patients, there were 37 (59.67%) and 36 (58.06%) male patients among Group K and Group T respectively. There was no gender difference when two groups were compared statistically. ( $p>.05$ )
- Amongst ASA Grade I patients, 34 (54.84%) were included in group K and 32 (51.61%) patients were included in Group K. There was no significant statistical difference in ASA grade distribution amongst two groups. i.e. matching in ASA grading was done during selection of subjects.
- Mean BMI of group K was  $21.73 \pm 5.18$  and that of group T was  $22.84 \pm 5.43$ . There was no significant difference in BMI distribution amongst the two groups ( $p>.05$ )
- The mean duration of surgery in patients in Group K was  $60.72 \pm 14.73$  minutes and in Group T was  $64.17 \pm 12.83$  minutes.
- This difference in duration of surgery in patients in two groups was statistically not significant ( $P > 0.05$ ).
- Before administering induction dosages of either medication, the baseline characteristics were noted. In Group K and Group T, the average heart rate was  $81.52 \pm 7.13$  and  $80.36 \pm 6.54$  respectively. (Table 1) (Figure 1)

- Mean systolic blood pressure in Group K and Group T was  $128.32 \pm 11.12$  and  $126.38 \pm 10.36$  mm of Hg respectively. (Table 2) (Figure 2)
- Mean diastolic blood pressure in Group K and Group T was  $78.73 \pm 5.18$  and  $79.84 \pm 5.43$  mm of Hg respectively. (Table 3) (Figure 3)
- Mean O2 saturation in Group K and Group T was  $98.68 \pm 5.28$  and  $98.76 \pm 5.3$  % respectively. (Table 4) (Figure 4)
- Mean arterial pressure in Group K and Group T was  $94.25 \pm 4.57$  and  $95.41 \pm 3.76$  mm of Hg respectively. (Table 5) (Figure 5)
- The mean intra-operative heart rate among patients from Group K compared to Group T at different time intervals shows no statistical significance. ( $P > 0.05$ )
- The mean intra-operative systolic blood pressure among patients from Group K compared to Group T at different time intervals shows no statistical significance ( $P > 0.05$ )
- The mean intra-operative diastolic blood pressure among patients from Group K compared to Group T at different time intervals shows no statistical significance ( $P > 0.05$ )
- The mean arterial blood pressure among patients from Group K compared to Group T at different time intervals shows no statistical significance. ( $P > 0.05$ )
- The mean SPO2 among patients from Group K compared to Group T at different time intervals shows no statistical significance. ( $P > 0.05$ )

Table 1: Intraoperative monitoring of heart rate at different intervals among various group

Heart rate	Group K	Group T	P value
Basal	$81.52 \pm 7.13$	$80.36 \pm 6.54$	$>0.05$
At 1 minute	$70.26 \pm 7.13$	$70.93 \pm 7.83$	$>0.05$

At 3 minutes	$69.70 \pm 5.18$	$64.76 \pm 5.13$	$>0.05$
At 5 minutes	$68.63 \pm 6.29$	$74.16 \pm 5.34$	$>0.05$
At 10 minutes	$72.20 \pm 5.13$	$70.76 \pm 5.25$	$>0.05$
At 15 minutes	$70.00 \pm 5.18$	$72.36 \pm 5.17$	$>0.05$
At 20 minutes	$77.10 \pm 5.23$	$79.10 \pm 5.21$	$>0.05$
At 30 minutes	$75.06 \pm 5.38$	$76.40 \pm 5.17$	$>0.05$
At 40 minutes	$72.83 \pm 4.98$	$76.56 \pm 4.87$	$>0.05$
At 50 minutes	$70.26 \pm 4.23$	$74.73 \pm 5.18$	$>0.05$
At 60 minutes	$72.18 \pm 5.83$	$74.36 \pm 4.67$	$>0.05$
End of surgery	$74.63 \pm 5.59$	$70.50 \pm 4.63$	$>0.05$

Figure 1: Intraoperative monitoring of heart rate at different intervals among various group



Table 2: Intraoperative monitoring of systolic blood pressure a different interval among various group

Systolic Blood pressure	Group K	Group T	P value
Basal	$128.32 \pm 11.12$	$126.38 \pm 10.36$	$>0.05$
At 1 minute	$120.23 \pm 10.72$	$121.93 \pm 10.42$	$>0.05$
At 3 minutes	$118.73 \pm 8.69$	$113.00 \pm 8.13$	$>0.05$
At 5 minute	$115.80 \pm 8.73$	$119.60 \pm 7.87$	$>0.05$
At 10 minute	$113.86 \pm 8.42$	$116.60 \pm 8.62$	$>0.05$
At 15 minute	$112.66 \pm 8.21$	$114.26 \pm 8.12$	$>0.05$
At 20 minute	$110.83 \pm 7.87$	$112.20 \pm 8.73$	$>0.05$
At 30 minute	$108.30 \pm 6.89$	$109.40 \pm 6.89$	$>0.05$
At 40 minute	$115.73 \pm 7.43$	$116.66 \pm 7.14$	$>0.05$
At 50 minute	$114.28 \pm 7.91$	$115.11 \pm 6.93$	$>0.05$
At 60 minute	$112.21 \pm 6.88$	$113.52 \pm 6.41$	$>0.05$
End of surgery	$116.73 \pm 7.49$	$116.98 \pm 7.89$	$>0.05$

Figure 2: Intraoperative monitoring of systolic blood pressure at different intervals among various group

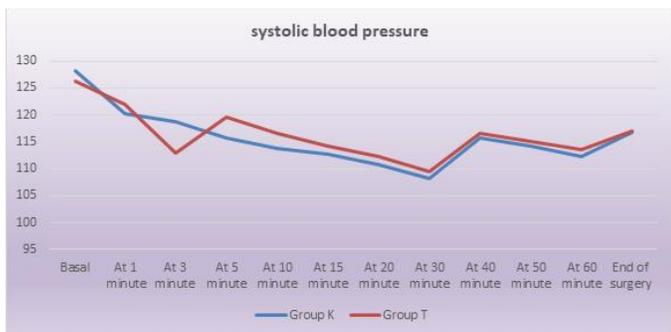


Table 3: Intraoperative monitoring of diastolic blood pressure at different intervals among various group

Diastolic Blood pressure	Group K	Group T	P value
Basal	78.73±5.18	79.84±5.43	>0.05
At 1 minute	75.36±4.81	75.53±5.26	>0.05
At 3 minute	73.70±4.41	74.46±5.43	>0.05
At 5 minute	72.13±4.82	73.73±5.08	>0.05
At 10 minute	70.26±4.71	71.73±4.79	>0.05
At 15 minute	69.23±5.18	69.66±4.18	>0.05
At 20 minute	68.60±4.19	67.56±4.23	>0.05
At 30 minute	66.13±4.28	65.60±5.63	>0.05
At 40 minute	64.76±4.63	64.00±5.21	>0.05
At 50 minute	63.46±4.79	61.90±5.41	>0.05
At 60 minute	61.87±4.43	60.70±5.39	>0.05
End of surgery	64.10±4.73	61.54±5.23	>0.05

Figure 3: Intraoperative monitoring of diastolic blood pressure at different intervals among various group

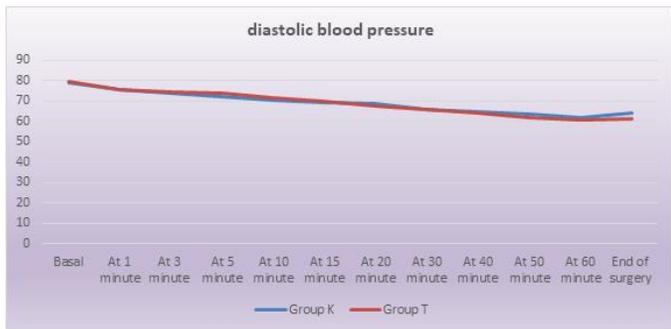


Table 4: Intraoperative monitoring of mean arterial pressure at different intervals among various group

Mean arterial pressure	Group K	Group T	P value
Basal	94.25 ±4.57	95.41 ± 3.76	>0.05
At 1 minute	92.94 ± 4.21	92.57 ± 5.17	>0.05
At 3 minute	90.62 ± 6.63	90.49 ± 5.35	>0.05
At 5 minute	88.48 ± 5.78	89.33 ± 5.34	>0.05
At 10 minute	87.02 ± 5.17	85.68 ± 5.34	>0.05
At 15 minute	86.64 ± 4.21	84.98± 5.34	>0.05
At 20 minute	86.46± 4.76	77.13 ± 5.41	>0.05
At 30 minute	84.46 ± 6.46	75.54 ± 5.68	>0.05
At 40 minute	82.46 ± 6.13	76.60 ± 5.71	>0.05
At 50 minute	80.15 ± 5.91	78.31 ±4.57	>0.05
At 60 minute	80.74 ± 5.02	79.52 ±4.83	>0.05
End of surgery	82.13 ±4.34	81.22 ±4.91	>0.05

Figure 4: Intraoperative monitoring of mean arterial pressure at different intervals among various group.

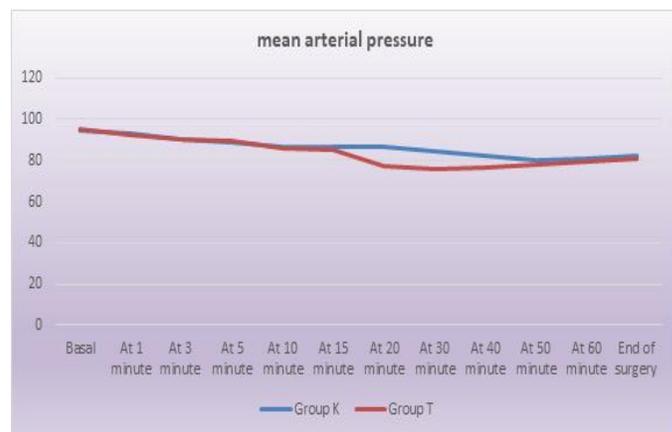


Table 5: Intraoperative monitoring of SPO2 at different intervals among various group

SPO2	Group K	Group T	P value
Basal	94.68±5.28	95.76±5.32	>0.05
At 1 minute	98.56 ±0.28	98.93 ±0.77	>0.05
At 3 minute	96.90±1.36	96.56±2.31	>0.05

At 5 minute	93.63 ±2.31	94.06±2.32	>0.05
At 10 minute	94.23 ±2.43	94.86±2.29	>0.05
At 15 minute	96.50±2.21	95.56±1.14	>0.05
At 20 minute	96.86±2.41	96.00±1.21	>0.05
At 30 minute	96.96 ±1.14	94.83±2.43	>0.05
At 40 minute	96.97 ±1.39	95.26±2.28	>0.05
At 50 minute	96.97 ±1.29	96.26±2.63	>0.05
At 60 minute	96.70±2.43	96.97 ±1.29	>0.05
End of surgery	96.96±2.72	97.18 ±1.21	>0.05

Figure 5: Intraoperative monitoring of SPO2 at different intervals among various group.



## Discussion

A total sample size of 124 patients was included in the study. The computer assisted randomization of patients were done and divided into 2 groups of 62 subjects each. Group K (Receiving Ketamine and ondansetron intra venously) and Group T (Tramadol and ondansatron intra venously)

In the present study, the mean age in group K was 35.84 years and group T was 36.02 years. There was no significant difference in age distribution in all two groups. ( $p > 0.05$ )

Out of total 124 patients, there were 37 (59.67%) and 36 (58.06%) male patients among Group K and Group T

respectively. There was no gender difference when two groups were compared statistically. ( $p > 0.05$ )

In the present study, the mean duration of surgery in patients in Group K was  $60.72 \pm 14.73$  minutes and in Group T was  $64.17 \pm 12.83$  minutes. This difference in duration of surgery in patients in two groups was statistically not significant. ( $P > 0.05$ ).

Gemechu AD et al.(11) studied effect of ketamine versus tramadol on prophylactic post-spinal shivering observed no statistically significant difference ( $p > 0.05$ ) amongst them with respect to time of surgery.

Girmay Fitiwi Lema et al.(12) in a study showed duration of surgery were comparable among the groups.

In the present study, the mean intra-operative heart rate among patients from Group K compared to Group T at different time intervals shows no statistical significance. ( $P > 0.05$ )

Similarly, mean intra-operative systolic, diastolic and arterial blood pressure among patients from Group K compared to Group T at different time intervals shows no statistical significance. ( $P > 0.05$ ) The mean SPO2, respiratory rate and temperature among patients from Group K compared to Group T at different time intervals shows no statistical significance. ( $P > 0.05$ )

Shen Q-H et al.(13) observed intraoperative hemodynamic parameters in the ketamine and tramadol groups did not show significant changes in hemodynamic parameters. This may be because ketamine is a sympathomimetic drug that raises mean arterial blood pressure, and preloading with IV fluid that has been pre-warmed to 37 degree C may also be to blame. The study conducted in the faculty of medicine, Tanta University, Egypt, showed the change in the mean temperature in the tramadol group was not statistically significant at any time of the post-anesthesia period.

That may be because they measured tympanic membrane temperature.(14)

Gemechu AD et al.(11) studied effect of ketamine versus tramadol on prophylactic post-spinal shivering observed there was a statistically significant difference in body temperature between the two groups, with *p*-values of 0.003, 0.001, and 0.001 at a time interval of 40, 50, and 60 min, respectively. After spinal anesthesia, patients in the tramadol groups had lower body temperatures than their starting points. This result was in opposition to the current research.

### Conclusion

The findings of present study conclude that the mean intra-operative heart rate among patients from Group K compared to Group T at different time intervals shows no statistical significance.

The mean intra-operative systolic, diastolic and arterial blood pressure among patients from Group K compared to Group T at different time intervals shows no statistical significance. The mean SPO<sub>2</sub>, among patients from Group K compared to Group T at different time intervals shows no statistical significance.

### References

1. Koay CK, Chan WY, Chin MK. Shivering during regional anesthesia and its control with Pethidine. *Singapore Med J.* 1991; 32:160-2.
2. Glosten B, Hynson J, Sessler DI, McGuire J. Pre anesthetic skin- surface warming reduces redistribution hypothermia caused by epidural block. *Anesth Analg.* 1993; 77:488-93.
3. Choi KE, Park B, Moheet AM, Rosen A, Lahiri S, Rosengart A. Systematic Quality Assessment of Published Ant shivering Protocols. *Anesth Analg.* 2017; 124:1539–1546.

4. Park SM, Mangat HS, Berger K, Rosengart AJ. Efficacy spectrum of ant shivering medications: Meta-analysis of randomized controlled trials. *Crit Care Med.* 2012; 40:3070–3082.
5. Megalla SA, Mansour HS. Dexmedetomidine versus Nalbuphine for treatment of postspinal shivering in patients undergoing vaginal hysterectomy: a randomized, double blind, controlled study. *Egyptian Journal of Anaesthesia* 2016; 33: 47–52.
6. Bhattacharya P, Bhattacharya L, Jain R, Agarwal R. Post Anaesthesia Shivering. *Indian J. Anaesth* 2003; 47 (2): 88-93.
7. Frank SM, Beattie C, Christopherson R, Norris EJ, Rock P, Parker S, Kimball AW: Epidural versus general anesthesia, ambient operating room temperature, and patient age as predictors of inadvertent hypothermia. *Anesthesiology* 1992; 77: 252–7.
8. Pitoni S, Sinclair HL, Andrews PJ. Aspects of thermoregulation physiology. *Curr Opin Crit Care.* 2011;17(2):115-21.
9. Mathews S, Al Mulla A, Varghese P, Radim K, Mumtaz S. Postanaesthetic shivering-a new look at tramadol. *Anaesthesia.* 2002;57(4):394–398.
10. Kelsaka E, Baris S, Kara kaya D, Sarihasan B. Comparison of ondansetron and meperidine for prevention of shivering in patients undergoing spinal anesthesia. *Regional Anesthesia & Pain Medicine.* 2006 Jan 1; 31 (1):40-5.
11. Gemechu, A.D., Gebremedhin, T.D., Andebiku, A.A. et al. The effect of ketamine versus tramadol on prophylactic post-spinal shivering in those patients undergoing orthopedic surgery: a prospective cohort study design, 2020. *BMC Anesthesiol* 22, 361 (2022).
12. Lema GF, Gebremedhn EG, Gebregzi AH, Desta YT, Kassa AA. Efficacy of intravenous tramadol and

low-dose ketamine in the prevention of post-spinal anesthesia shivering following cesarean section: a double-blinded, randomized control trial. *International journal of women's health*. 2017 Sep 26:681-8.

13. Shen Q-H, Li H-F, Zhou X, Lu Y, Yuan XZ. 5-HT<sub>3</sub> receptor antagonists for the prevention of perioperative shivering undergoing spinal anaesthesia: a systematic review and meta-analysis of randomised controlled trials. *BMJ open*. 2020;10(10): e038293.

14. Sessler DI, Robins ten EH, Moayeri A. physiologic responses to mild preanaesthetic hypothermia in humans. *Anesthesiology* 1991; 75:594-610.