



A Comparative Study of IV Dexamethasone Vs Tramadol for Prevention of Shivering in Patients with Sub-Arachnoid Block

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ABSTRACT:

BACKGROUND INFORMATION:

Spinal anaesthesia is a commonly used, safe technique for anaesthesia in various surgeries. However, it can lead to thermoregulatory impairment, especially when combined with the administration of cold intravenous fluids and exposure to a cool operating room environment. This can result in hypothermia in warmed surgical patients, leading to intraoperative and postoperative shivering which varies in severity, the pharmacological and non-pharmacological treatments used pharmacological methods for the treatment and prevention of shivering for this study include tramadol (0.5mg/kg) which is an opioid analgesic and dexamethasone(0.8mg/kg) which is anti-inflammatory in patients undergoing subarachnoid block.

MATERIALS AND METHODS: A descriptive research approach with non-experimental

The design was adopted for the study of 100 patients with the symptoms of shivering who met the inclusion criteria, were selected for the study, and the shivering data were collected from the subjects who underwent spinal anesthesia during the surgery after administration of drugs.

RESULTS: The age-wise distribution of participants with males (53%) and females (47%). Most participants (36%) were females who experienced shivering more often, which emphasized the need for gender-specific considerations. The significant majority of spinal anesthesia cases involved patients with ASA-1 shows 66%. Severity peaked in the 31-40 age



group. Dexamethasone and Tramadol were similarly effective in preventing shivering, with choice depending on severity.

CONCLUSION: In conclusion, Dexamethasone and Tramadol are both effective in reducing post-operative shivering. Tramadol was linked to a significantly higher rate of adverse effects compared to Dexamethasone. The choice between the two should be based on individual patient factors, including the severity of shivering, overall health, and risk of complications. This study provides valuable evidence to guide clinicians in selecting the most appropriate medication for their patients.

Introduction

One frequent and upsetting side effect seen in individuals having subarachnoid block (SAB) surgery is shivering. As a physiological reaction to hypothermia or other stresses brought on by regional anaesthesia, it is an involuntary, repeated muscle activity. In addition to being uncomfortable for patients, postoperative shivering can have serious haemodynamic and metabolic repercussions, such as increased carbon dioxide generation, oxygen demand, and catecholamine release. These effects might lead to negative consequences in patients with low cardiopulmonary reserves.[1]

Causes and Mechanisms of Shivering in Subarachnoid Block

Shivering after SAB is caused by a number of factors, such as the redistribution of body heat, the disruption of central thermoregulation, and the impact of anaesthetics on neurotransmitter pathways. Due to the lack of sympathetic tone caused by spinal anaesthesia, vasodilation and a decrease in core body temperature occur, which sets off compensatory mechanisms like shivering to produce heat. Pharmacological intervention is an effective technique for preventing shivering since opioid receptors and serotonin pathways both modulate the body's reaction to temperature fluctuations. The hypothalamus, which combines sensory inputs from the skin and core body areas, is principally responsible for controlling body temperature. Because autonomic nerves are blocked during spinal anaesthesia, the body's thermoregulatory response is changed, especially

in the lower body, which causes an imbalance between heat generation and heat loss. One of the main causes of postoperative shivering in individuals having SAB is this thermoregulatory imbalance.[2]

Pharmacological Interventions for Shivering

A number of pharmacological and non-pharmacological methods have been used to control or avoid shivering after spinal anaesthesia. Drugs, including opioids, alpha-2 adrenergic agonists, 5-HT₃ receptor antagonists, and N-methyl-D-aspartate (NMDA) receptor antagonists, have all been investigated as pharmacological therapies. Intravenous (IV) dexamethasone and IV tramadol are two frequently used medications in this context; they both are successful in avoiding or lowering the occurrence of shivering, while having distinct modes of action. In addition to medication therapy, non-pharmacological strategies like as active warming devices, preoperative warming, and preserving an ideal operating room temperature can be employed to improve patient comfort. It has been demonstrated that prewarming patients with forced-air warming systems before surgery lowers the risk of shivering during and after the operation. Another helpful technique is fluid warming because giving cold intravenous fluids might cause hypothermia and shivering.[3]

Dexamethasone in the Prevention of Shivering

Because of its anti-inflammatory and immunosuppressive qualities, the synthetic corticosteroid dexamethasone is utilised



extensively. It has also been demonstrated to have analgesic and antiemetic properties, making it a flexible perioperative medicine tool. It is believed that its effects on central thermoregulatory systems, inhibition of inflammatory cytokines, and modification of neurotransmitter activity are responsible for its ability to suppress shivering following spinal anaesthesia. Research is still being done to determine the precise mechanism by which dexamethasone reduces shivering. According to recent research, the thermoregulatory imbalance observed in SAB-induced hypothermia may be caused by dexamethasone's modulation of prostaglandin formation and reduction of inflammatory mediators. Dexamethasone is a potential option for preventing shivering since it helps control core temperature by balancing the hypothalamic-pituitary-adrenal axis. Its lengthy half-life also enables prolonged effect, extending protection against shivering without requiring repeated dosage.[4]

Tramadol in the Prevention of Shivering

Another medication that is frequently used for shivering prevention is tramadol, a centrally acting analgesic with modest opioid characteristics. It works by preventing serotonin and norepinephrine from being reabsorbed, which improves central thermoregulation. Additionally, it works well to reduce shivering and control pain because of its opioid action. Tramadol is a recommended option in many therapeutic settings since studies have shown that it successfully lowers the frequency and severity of post-anesthetic shivering. Tramadol's dual mode of action, in contrast to conventional opioids, increases its efficacy in thermoregulation. Tramadol aids in maintaining the hypothalamic-regulated set-point temperature by boosting serotonin availability in the central nervous system. Furthermore, it interacts with opioid receptors, but less strongly than conventional opioids, which results in fewer side effects, including respiratory depression. However, adverse symptoms, including nausea, vomiting,

and dizziness, are linked to its use, which could prevent it from being widely used.[5]

Comparative Analysis: Dexamethasone vs. Tramadol

Although dexamethasone and tramadol are frequently used to decrease shivering after spinal anaesthesia, there is continuous discussion over their relative effectiveness, safety, and ideal dosage. Despite its well-known analgesic properties, tramadol can cause adverse symptoms such as nausea, vomiting, and lightheadedness. However, despite its advantages, long-term use of dexamethasone might result in immunosuppression, delayed wound healing, and hyperglycemia. As a result, knowing these medications' relative efficacy and safety is essential for directing clinical judgment. The effectiveness of dexamethasone and tramadol in reducing shivering has been examined in a number of clinical studies. While some studies indicate that dexamethasone gives longer protection with fewer side effects, others report that tramadol controls shivering more quickly and effectively. The necessity for tailored treatment strategies based on patient characteristics and surgical circumstances is highlighted by the variation in patient responses. Additionally, when using either medication as part of a multimodal perioperative care plan, the possibility of drug interactions needs to be taken into account.[6, 7]

Material And Methods

The Department of Anaesthesia at Malla Reddy Hospital in Suraram, Hyderabad, Telangana, did a prospective comparative hospital-based research titled "The comparative study of IV dexamethasone vs. tramadol for prevention of shivering in patients with sub-arachnoid block." One hundred participants participated in the six-month trial. Each patient gave their informed consent after being fully told about the study's methodology. Following ethical approval, a patient data collection form was used to gather all necessary information. Convenient sampling was used to gather the data over six months. Six days



a week, data were gathered from a variety of procedures conducted in departments such as gynaecology, general surgery, orthopaedics, and urology. Data on the clinical profile, anaesthesia record, and sociodemographic traits were gathered. The process usually entails giving the patient intravenous medication when they shiver and then tracking their reactions over time; the specifics vary based on the goals and design of the study. After explaining informed consent to the patient, patient data was gathered and organised in a database for analysis using the appropriate design data collection form. Based on inclusion and exclusion criteria, patients were evaluated. ASA (American Society of Anaesthesiology) physical status classification 1,

2, and patients who experience shivering after spinal anaesthesia are among the inclusion criteria. Patients must be between the ages of 20 and 60. Patients having a history of ischaemic heart disease, mental health or psychological issues, epilepsy, glaucoma, allergies to the study medications, and those whose baseline body temperature was lower than 36.5 degrees are among the exclusion criteria. Patients with coagulation abnormalities or on anticoagulant medication, those with developmental delays, neurological deficits, spinal deformities, etc., and those who are unwilling to provide their permission are excluded. In conclusion, a statistician used IBM SPSS Software for additional analysis.

Results:

Age-wise distribution of the study participants

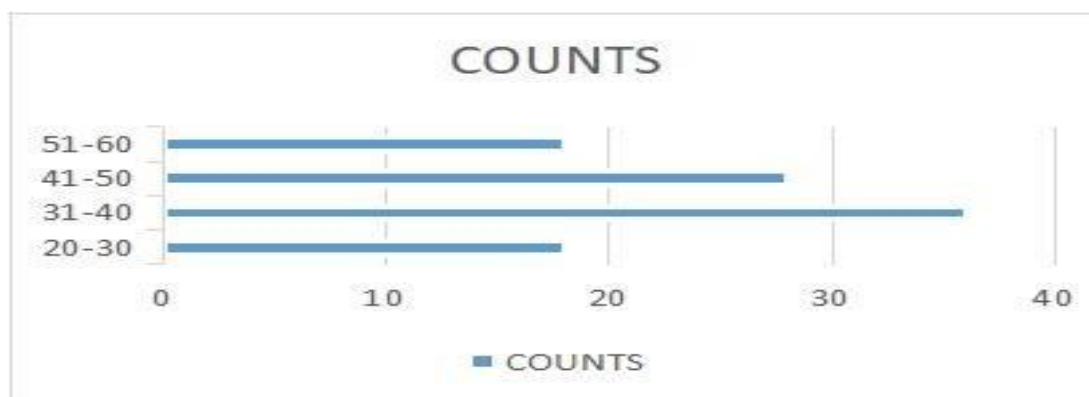


Figure 1: Graphical representation of Age-wise distribution of the study participants.

According to the study participants' age distribution, the majority of patients (36%) are between the ages of 31 and 40. This distribution

shows how common the study's target age group is and sheds light on the possible effects of shivering during spinal anesthesia.

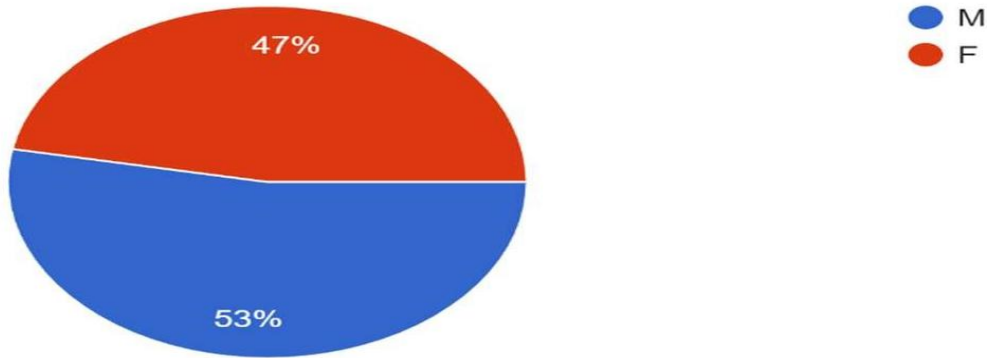


FIGURE 2: Graphical representation of Gender distribution among the study population.

Gender distribution among the study population reveals a higher representation of male patients, constituting 53% of the total. Female patients account for 47% of the population. This disparity in

gender distribution emphasizes the need for gender-specific considerations when assessing and managing spinal anesthesia shivering within the clinical setting.

TABLE 1: ASA GRADE-wise distribution of the study population

ASA_GRADING	NO.OF PATIENTS	% OF TOTAL
1	66	66.0%
2	34	34.0%

The ASA grading for the study population shows that 66% of patients are classified as grade 1, while 32% are classified as grade 2. This distribution

highlights that a significant majority of spinal anaesthesia cases involve patients with ASA grade 1.

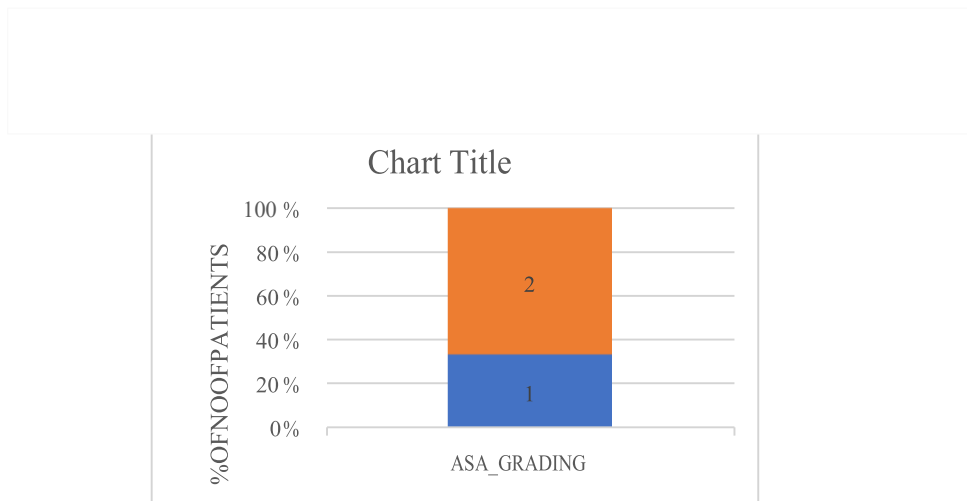


FIGURE 3: Graphical representation of ASA grade-wise distribution of the study population.

**TABLE 2: Age-wise Severity of Study Population**

Dependent Variable	SEX	F	M	Total
SEVERITY_GRADING	1	8 (17.0%)	11 (20.8%)	19 (19.0%)
SEVERITY_GRADING	2	15 (31.9%)	24 (45.3%)	39 (39.0%)
SEVERITY_GRADING	3	17 (36.2%)	16 (30.2%)	33 (33.0%)
SEVERITY_GRADING	4	7 (14.9%)	2 (3.8%)	9 (9.0%)
AGE_class	20-30 years	13 (27.7%)	5 (9.4%)	18 (18.0%)
AGE_class	31-40 years	14 (29.8%)	22 (41.5%)	36 (36.0%)
AGE_class	41-50 years	16 (34.0%)	12 (22.6%)	28 (28.0%)
AGE_class	51-60 years	4 (8.5%)	14 (26.4%)	18 (18.0%)

Severity age	1	2	3	4	Total %
20-30	1 (5.3)	6 (15.4)	7 (21.2)	4 (44.4)	18%
51-60	6 (31.6)	5 (12.8)	5 (15.2)	2 (22.2)	18%
41-50	8 (42.1)	11 (28.2)	8 (24.2)	1 (11.1)	28%
31-40	4 (21.1)	17 (43.6)	13 (39.4)	2 (22.2)	36%

TABLE 3: Gender-based distribution of age and Severity of shivering in Study Population

The age wise severity of study population shows that Younger Age Groups: The 20-

30 age group appears to have a lower prevalence of the most severe condition (severity 4) compared to older age groups.

Peak Severity in Middle Age: The 31-40 age group exhibits the highest prevalence of severity 4, suggesting that middle age may be a period of increased risk for experiencing the most severe form of the condition.

Decreasing Severity in Older Age: The 41-50 and 51-60 age groups show a decreasing trend in the prevalence of severity, indicating that the condition's severity may diminish with age.

Also, the Gender based study population shows that Females have higher prevalence of shivering than males.

Reoccurrence of shivering

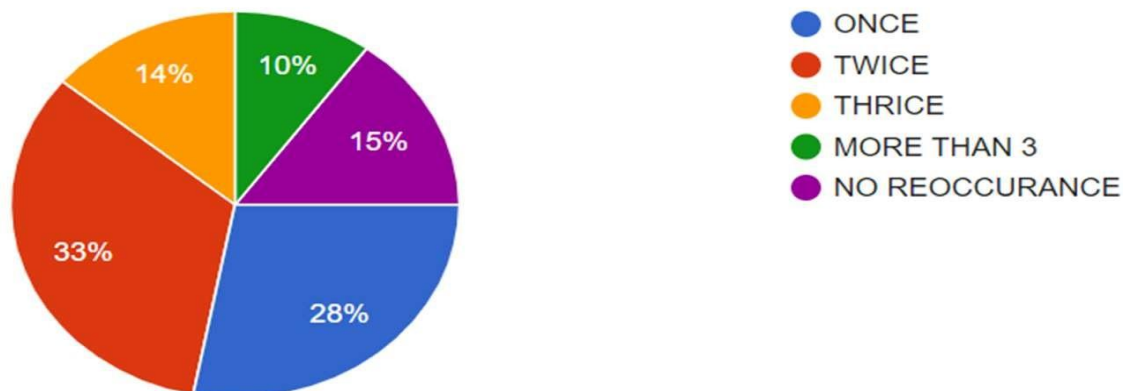


FIGURE 4: Graphical representation of Reoccurrence of shivering.

TABLE 4: Reoccurrence of shivering

REOCCURENCE	DEXAMETHASONE(N=50)	TRAMADOL(N=50)	TOTAL(N=100)
MORE THAN 3	5	5	10
NO REOCCURANCE	6	8	15
ONCE	15	13	28
THRICE	8	6	14
TWICE	17	16	33

According to the recurrence data, differences in the patterns of recurrence between the two groups, Dexamethasone appears to have a slightly higher

recurrence rate than Tramadol; thus can say both drugs are equally effective in preventing /reducing the recurrence of shivering after spinal anesthesia.

Administration of Drugs based on severity of shivering

TABLE 5: Administration of Drugs based on severity of shivering.

SEVERITY(GRADING)	DEXAMETHASONE	TRAMADOL	SEVERITY- Total
1	14	5	19
2	20	19	39
3	12	21	33
4	4	5	9
Total	50	50	100

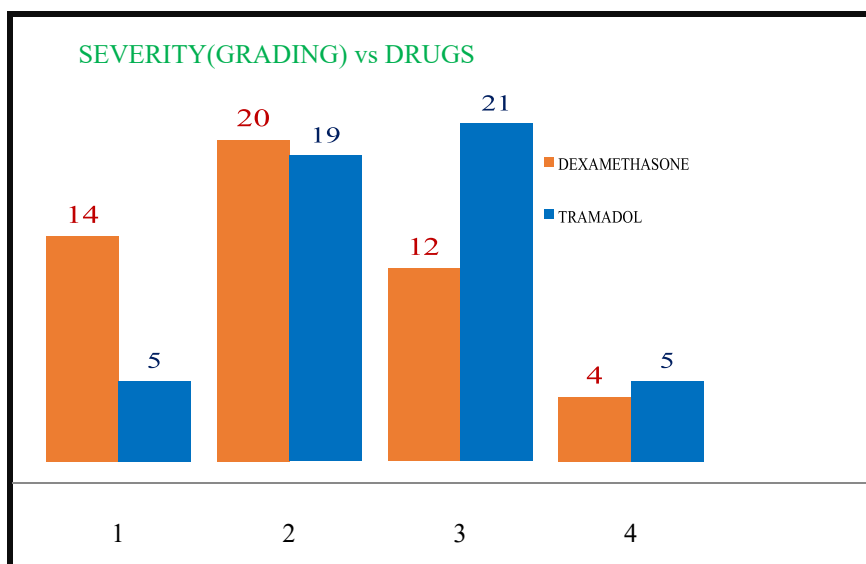


FIGURE 5: Graphical representation of Administration of Drugs based on severity of shivering

Administration of Drugs based on the severity of shivering indicates that dexamethasone was preferred for grade 1 severity. For grades 2 and 3, the choice of the drug depended on the patient's **Response rate of drugs**

condition. Tramadol was favored for grade 4 severity, with a 10% preference compared to 8% for dexamethasone.

TABLE 6: Response rate of drugs.

	2	3	4	5	6	7	8	9	10
DEXAMETHA- -SONE	6(54.5)	16(61.5)	11(45.8)	8(36.4)	4(50.0)	0	1(33.3)	0	0
TRAMADOL	5 (45.5)	10(38.5)	13(54.2)	14(63.6)	4(50.0)	4 (100)	2(66.7)	1(100)	1(100)
RR-Total	11(11%)	26(26%)	24(24%)	22(22%)	8 (8%)	4 (4%)	3 (3%)	1(100)	1(100)



Response rate

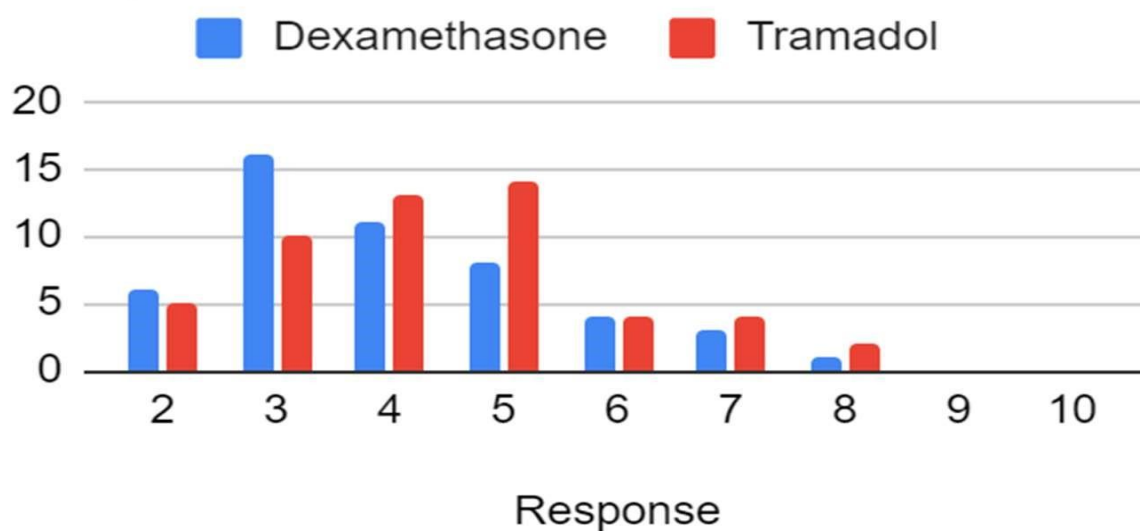


FIGURE 6: Graphical representation of Response rate of drugs.

It is observed that the response rate or time of cessation in minutes is quite similar to that of both the drugs, but on keen observation, we can observe Dexamethasone time of cessation is much faster than Tramadol's.

Complications of drugs

TABLE 7: Complications of dexamethasone

COMPLICATIONS_OF_DEXAMETHASONE	DRUG_UPON_SHIVERING		P value
	DEXAMETHASONE	RATIO	
BRADYCARDIA	1	4.0	< 0.001 ¹
NAUSEA AND VOMITING	1	8.0	
NAUSEA AND VOMITING, BRADYCARDIA	2	4.0	
NO COMPLICATION	42	84.0	
DRUG_UPON_SHIVERING-TOTAL	50	100.0	

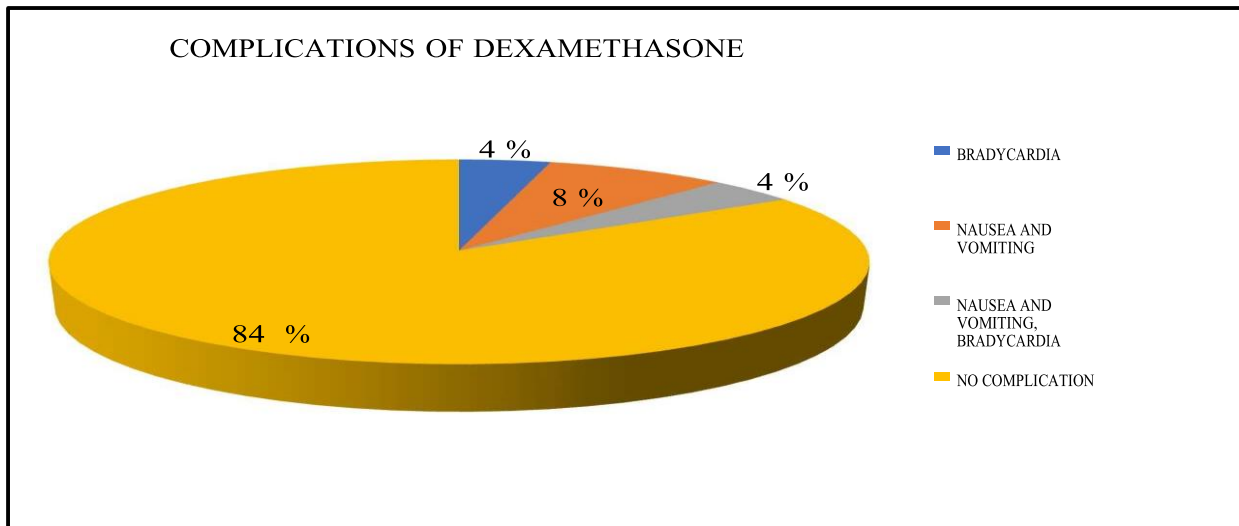


FIGURE 7: Graphical representation of Complication of dexamethasone

TABLE 8: Complication of Tramadol

COMPLICATIONS_OF_TRAMADOL	TRAMADOL	RATIO	P value
HYPOTENSION, BRADYCARDIA	1	2.0	<0.001 ¹
HYPOTENSION, NAUSEA, VOMITING, ANXIETY	1	2.0	
HYPOTENSION, SEDATION	1	2.0	
HYPOTENSION, TACHYCARDIA, ANXIETY	1	2.0	
NAUSEA AND VOMITING, SEDATION, TACHYCARDIA	1	2.0	
NAUSEA AND VOMITING, TACHYCARDIA	1	2.0	
SEDATION, ANXIETY	1	2.0	
TACHYCARDIA, ANXIETY	1	2.0	
NAUSEA AND VOMITING, SEDATION	2	4.0	
SEDATION	2	4.0	
BRADYCARDIA	3	6.0	
HYPOTENSION, NAUSEA, AND VOMITING	4	8.0	
NAUSEA AND VOMITING, BRADYCARDIA	4	8.0	
TACHYCARDIA	4	8.0	
NAUSEA AND VOMITING	10	20.0	
NO COMPLICATION	13	26.0	
DRUG_UPON_SHIVERING-TOTAL	50	100.0	

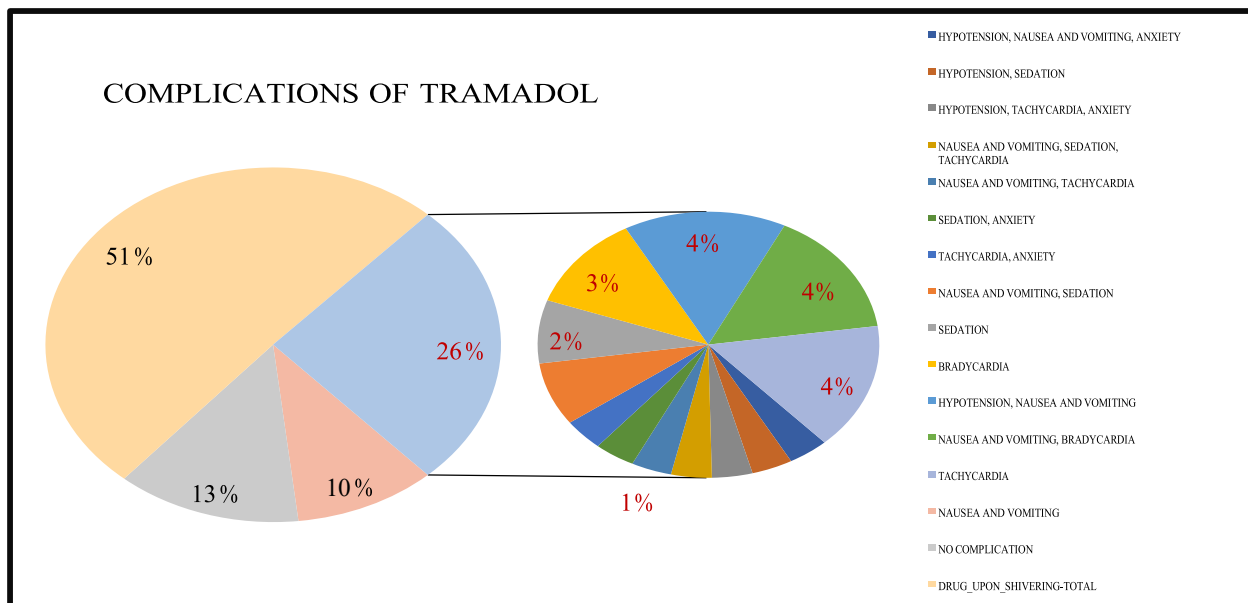


FIGURE 8: Graphical representation of complications of Tramadol

The above 2 tables indicate the complications of tramadol and dexamethasone, respectively. Although both of them are found to be significant ($P < 0.001^1$), it is observed that a greater number of complications arose on administration of Tramadol than Dexamethasone.

DISCUSSION

An involuntary rhythmic contraction of the skeletal muscles, known as shivering, is a typical reaction to loss of body temperature (Blondin and Haman, 2018). Thermoregulatory regulation disruptions can result in hypothermia brought on by anaesthesia, a chilly operating area, and surgical procedures that cause a large loss of body heat. Since hypothermia is a medical emergency, it must be treated right away (McSwain, 2015). Regardless of the underlying reason, shivering is a thermogenic reaction to restore normal body temperature in cases of intraoperative hypothermia. A synthetic opioid called tramadol has variable degrees of temperature control.[8,9] It works by preventing serotonin and norepinephrine from being reabsorbed in the spinal cord, which increases serotonin release (Flecknell, 2015). According to Baldo and Rose, tramadol works by interacting with alpha-2

adrenoceptors and kappa opioids to prevent shivering. Tramadol dosages between 0.5 and 3 milligrammes per kilogram have been shown in several trials to be effective in lowering postoperative shivering (Avais, 2022; Khan, 2022). Previous studies have found that the incidence of shivering with tramadol ranges from 8.8% to 16% (Beck, 2020). However, postoperative shivering was successfully avoided when dexamethasone (0.3–0.6 mg/kg) was taken into account (McSwain, 2015). Even when a lower dose of dexamethasone (0.1 mg/kg) is used to maintain effectiveness with little side effects, the incidence of Severing is 20.37% (Zahid, M.M., Khalid, 2023).[10, 11]

The goal of the current investigation was to evaluate the therapeutic effects of dexamethasone with tramadol to treat post-spinal anaesthesia perioperative shivering brought on by hypothermia. One hundred ASA grade I and II patients were divided into two groups at random. After shivering, group T (n=50) and group D (n=50) were given injections of tramadol 0.5 mg/kg and dexamethasone 0.8 mg/kg, respectively. Shivering was seen throughout both the preoperative and postoperative phases.[12]



The mean time of drug discontinuation, or the medication's reaction rate in minutes, was recorded after the drug was administered and was significant for both medicines. Our research reveals that dexamethasone causes shivering to stop a little faster than tramadol, which is two minutes. Tramadol has a reaction rate of 38.5% in 3 minutes, whereas Dexamethasone has a response rate of 61.5%. Additionally, in 5 minutes, Tramadol shows 54.2% and Dexamethasone shows 49.8%. Both medications have a 50% response rate at 6 minutes, indicating that they are both highly successful in reducing shivering. [13]

Dexamethasone appears to have a slightly higher recurrence rate than Tramadol, indicating that both medications are equally effective in preventing or reducing the recurrence of shivering following spinal anaesthesia, based on the recurrence data and differences in the patterns of recurrence between the two groups. We discovered that the prevalence of shivering is significantly higher in age groups between 31 and 40 (36%) and 41 and 50 (28%), as opposed to old patients (51–60; 18%) and young people (20–30; 18%). According to the study by Swati Kanchan Akif Mutahar Shah (2022), 42.8% of people have post-spinal shivering. Most of the patients were in the younger age range.[14]

Our research indicates that the side effects of both Tramadol and Dexamethasone are considerable ($P < 0.0011$), with more side effects being addressed when Tramadol is administered than when Dexamethasone is, at 74% and 16%, respectively. Additionally, 84% had no problems with dexamethasone, and 26% had no problems with tramadol. In line with G Alice Vinathi's findings, Tramadol was linked to a marginally increased frequency of adverse effects such as nausea and vomiting (Vinathi and Latha, 2018).[15, 16]

CONCLUSION

This study offers important new information on how well Dexamethasone and Tramadol work to

lower the frequency and length of shivering. In contrast to Tramadol, Dexamethasone exhibited a somewhat quicker reaction time. Additionally, the study offers data based on the severity grading scale, which differed for the two medication groups. Tramadol tended to produce higher severity levels, but dexamethasone was linked to a larger incidence of lower severity levels. The study emphasises that the prevalence of shivering was shown to be influenced by age, with middle-aged patients reporting a higher prevalence than younger and older persons. Although there were side effects associated with both medications, Tramadol was shown to have a noticeably greater frequency of side effects than Dexamethasone. Each patient's possible advantages and disadvantages should be carefully considered before choosing to use either Dexamethasone or Tramadol. It is important to consider variables such as the degree of shivering, the patient's general condition, and the possibility of consequences. This study helps to find thorough information regarding the relative safety and efficacy of both medications in reducing shivering by carefully gathering and analysing data from 100 individuals. Give medical professionals evidence-based recommendations for selecting the safest and most effective drug for each patient.

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