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Efficacy of Tramadol vs Pethidine for Control of Anaesthesia Induced Shivering in Patients undergoing Elective Caesarian Section under Spinal Anaesthesia

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ABSTRACT

Objective: To determine the effectiveness of tramadol for control of Anaesthesia Induced Shivering and compare it with pethidine in elective caesarian section patients under spinal anaesthesia.

Study Design: Quasi-experimental study

Place and Duration of Study: Main Operation Theatre, SKBZ/ Combined Military Hospital, Rawalakot Pakistan, from Jan to Jun 2020.

Methodology: After approval from the ethical review committee of the Hospital and taking patient's informed consent, 60 patients who developed grade 2 or 3 shivering after induction of spinal anesthesia were allocated to two group A & group B alternatively. Group A received IV tramadol 1mg/kg whereas Group B received IV pethidine 0.5mg/kg. SPSS version 21 was used to analyze the data and calculate mean and standard.

Results: Anaesthesia induced shivering was effectively controlled in 86.66% (n=26) participants in Tramadol Group versus 83.33% (n=25) participants in Pethidine Group, *p*-value was calculated as 0.0001 which was significant.

Conclusion: Tramadol is an acceptable, easily available, as well as a safer alternative to pethidine for control of anaesthesia induced shivering in patients having elective caesarean section under spinal anaesthesia.

Keywords: Anaesthesia Induced Shivering, Ceasarian Section, Pethidine, Spinal Anaesthesia, Tramadol.

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INTRODUCTION

Shivering is the body's response to core hypothermia by generating heat through involuntary contraction of the muscles. Anaesthesia impairs the autonomic thermoregulatory response of the body which coupled with cold intravenous fluids and environment of the operating room leading to shivering. Anaesthesia induced shivering commonly effects 5 - 65% and 30% of patients perioperatively during general and regional anaesthesia respectively.[1,2] The underlying etiology is not exactly known but anaesthesia induced shivering is physiologically stressful and causes considerable anxiety and discomfort to the patient.

Anaesthesia induced shivering can lead to multiple problems the most important being an increase in oxygen demand. Patient's oxygen consumption can increase up to 600% leading to life threatening complications like hypoxia and myocardial ischemia especially in patients with reduced cardiopulmonary reserves.[3-5] Shivering causes artifacts of the ECG, blood pressure, and pulse oximetry resulting in impaired patient monitoring.[6] It can also cause raised intracranial pressure, raised intra ocular pressure, lactic acidosis, pain at the operation site by stretching and is especially disturbing to mothers during labour and delivery.

Anaesthesia induced shivering is managed by non-pharmacological measures such as covering the patient with blankets, actively warming the patient with warm blankets or using warm infusions. Patients who do not respond to non pharmacological measures require pharmacological intervention. Pethidine (Meperidine) acts on the κ and μ - opioid receptors and is routinely used to treat anaesthesia induced shivering.[7] Known side effects of pethidine are respiratory depression, delirium, hallucinations, seizures, reversible Parkinsonism, urinary retention, constipation and mydriasis. However, tramadol hydrochloride has agonist activity on central μ-opioid receptors and is also used to prevent and control shivering having considerably fewer side effects as compared to other drugs in this class.[8]

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Meta-analysis by Charuluxananan *et al.*, found no considerable variation in the effectiveness of tramadol and pethidine in controlling Anaesthesia Induced shivering,[9] however, some authors have documented tramadol to be more effective than pethidine in this respect.[3,4,10] Bhatnagar *et al.*, so noted tramadol to be notably superior in controlling Anaesthesia Induced shivering among the two drugs.[11]

The rationale of our study is to determine the efficacy of Tramadol Vs Pethidine to control anaesthesia induced shivering in our set up keeping in view the availability and relative side effects of both drugs.

METHODOLOGY

This Quasi-experimental study was conducted in main operation theatre at SKBZ / CMH Rawalakot from January to June 2020 after approval from the hospital ethical review committee and taking patient's informed consent (IERB no. 1833/SKBZ/CMH/REC dated 18-11-2019). Sample size of 60 was with 95% confidence level, 5% margin of error and taking expected percentage of efficacy in tramadol group 80% vs. pethidine group 26.66%.[8] The sampling technique used was non probability convenient sampling. The patients were divided in 02 groups of 30 each.

Inclusion Criteria: Patients fulfilling following criteria were included in the study: American Society of Anaesthesiology (ASA) status I and II., Age between 25–40 years, Patients undergoing planned elective caesarian section under spinal anaesthesia, Cases who develop shivering of grade 2 or 3 post delivery.

Exclusion Criteria: Following patients were excluded from the subject research: Patients undergoing emergency caesarean section, Patients who developed obstetric complications, Patients who receive blood transfusion or blood products, Patients with history of fever in the last week, thyroid disease, obesity, diabetes, haemodynamic instability, raised intracranial pressure, Parkinson's disease, convulsions or psychological disorders.

Spinal block was carried out in the sitting position at intervertebral space L3–4/4–5 (midline approach) using a 25/27 gauge Quincke spinal needle with bupivacaine (0.5%, heavy) in a dose of 12.5 – 13.5 mg, to achieve T4–6 dermatome sensory level. Ringer's lactate solution 15ml/kg at room temperature was used to preload the patients 10 minutes prior to the administration of spinal anaesthesia. Standard monitoring of pulse rate, pulse oximetry and non-invasive blood pressure was carried out for all patients with Base line readings and subsequently at every 5 minutes after the spinal block. Room temperature was kept at 25°C–28°C.

Patients were monitored for up to 30 minutes post delivery. Those patients who developed shivering of grade 2 or 3 were included in the study after informed consent. These patients were allocated to group A and group B alternatively.

Group A received IV tramadol 1 mg/kg whereas; Group B received IV pethidine 0.5 mg/kg. Patients were also given supplemental oxygen via face mask at 6 L/min. Patients whose shivering score declined to '0' within 10 minutes of injecting the trial drug was taken as efficacy positive. All these readings were recorded by an anaesthetist.

The data was analyzed using SPSS version 21. Percentages were used to express frequencies. Effective control of shivering was assessed using Chi Square test. Confounders were controlled through stratification of age, weight and ASA status to see the impact of these on outcome variables. *p*-value <0.05 was considered significant.

RESULTS

A total of 60 (30 cases in each group) fulfilling the inclusion/exclusion criteria were included.

Table-I shows the distribution of age and weight of the subjects within the two groups. Mean values were calculated for these parameters in both groups and comparison showed that mean age in group A was 30.93+4.15 years versus 32.67±4.60 years in Group-B whereas the mean weight was calculated as 57.53±5.00 kgs in Group-A and 58.5±4.48 kgs in Group-B.

Table-I: Age & Weight Distribution of Patients (n=60)

Variable	Group-A (n=30)	Group-B (n=30)
Age (25-35 Years)	24(80.00%)	21(70.00%)
Age (36-40 Years)	6(20.00%)	9(30.00%)
Mean Age	30.93+4.15	32.67+4.60
Weight (40-60 Kgs)	21(70.00%)	19(63.33%)
Weight (>60 Kgs)	9(30.00%)	11(36.67%)
Mean Weight	57.53±5.00	58.5±4.48

Table-II shows the effectiveness of both drugs with respect to shivering. It was recorded as 86.66% (n=26) in Tramadol group (Group-A) and 83.33% (n=25) in Pethidine group (Group-B) while there was

no effect on shivering in 13.33% (n=4) subjects in Tramadol group (Group-A) and 16.66% (n=5) subjects in Pethidine group (Group-B). A *p*-value of 0.0001 was calculated which is statistically significant.

Table-II: Comparison of Efficacy of Control of Shivering Between the Two Groups (n=60)

Efficacy	Group-A (n=30)	Group-B (n=30)	*p*-value
	No. of patients (%)	No. of patients (%)	
Yes	26(86.66 %)	25(83.33%)	0.0001
No	4(13.33%)	5(16.66%)	
Total	30(100.00%)	30(100.00%)	

Comparison of efficacy of two groups with regards to age was done in Table-III, where in Group-A, out of 26 effective cases, 21(80.76%) were between 25-35 years and 5(19.23%) were between 36-40 years of age. Pethidine group had 25 effective cases, and out of them 18(72%) were between 25-35 years and 7(28%) were between 36-40 years of age. *p*-value for age group 25-35 years and 36-40 years was 0.7 and 0.6 respectively which is insignificant.

The efficacy of the drugs amid the two groups was compared with respect to weight in Table-III. In Group-A, out of 26 effective cases, 19(73.07%) were between 40-60 kgs and 7(26.92%) weighed more than 60 kgs. Pethidine group had 25 effective cases, and out of them 18(72%) were between 40-60 kgs and 7(28%) were having weight more than 60 kgs. *p*-value for patients with weight 40-60 kgs and >60 kgs was calculated to be 0.6 and 0.7 respectively which is again insignificant.

Table-III: Association of Efficacy of Control of Shivering between the Groups with Regards to Age, Weight and ASA Status

Variable	Efficacy	Group A n(%)	Group B n(%)	*p*-value
For Age 25-30 Years	Yes	21(87.5%)	18(85.7)	0.7
	No	3(12.5%)	3(14.3%)	
For Age 36-40 Years	Yes	5(83.3%)	7(77.8%)	0.6
	No	1(16.7%)	2(22.2%)	
For Weight 40-60 Kgs	Yes	19(90.5%)	18(90.0%)	0.6
	No	2(9.5%)	2(10.0%)	
For Weight >60 Kgs	Yes	7(77.8%)	7(70.0%)	0.8
	No	2(22.2%)	3(30.0%)	
For ASA–I	Yes	18(85.7)	15(83.3%)	0.8
	No	3(14.3%)	3(16.7%)	
For ASA–II	Yes	8(88.9%)	10(83.3%)	0.7
	No	1(11.1%)	2(16.7%)	

Taking into account ASA status, the two groups were compared as shown in Table-III. In Group-A, out of 26 effective cases, 18(69.23%) had ASA-I and 8(30.76%) had ASA-II. Pethidine group had 25 effective cases, and out of them 15(60%) had ASA-I and 10(40%) had ASA-II. Again *p*-value calculated for ASA-I and ASA-II groups was 0.8 and 0.7 which is insignificant.

DISCUSSION

30 to 60% of the patients undergoing surgeries under Spinal or Epidural Anaesthesia routinely develop anaesthesia induced Shivering in Early period.[12] Use of volatile anaesthetics has been linked to the development of post anaesthetic shivering however, the underlying cause is not clearly understood. General / regional anaesthesia, loss of heat from the patient's body and use of hypothermic intravenous solutions can also contribute to the development of post anaesthetic shivering.[12]

We planned this study to determine whether tramadol is a good substitute to pethidine when it comes to controlling shivering in the post anaesthesia phase. Although pethidine has been historically used for this purpose with great success but it is a controlled opioid pharmacologic agent so it is not routinely or readily available in most setups as well as carries the risk of serious side effects and the predisposition to develop addiction.

The results of our study are in the same range as noted by Bhatnagar *et al.,*[11] who found tramadol (80%) to be more effective than pethidine (26.22%) for controlling post anaesthesia shivering. Both tramadol and pethidine effectively control shivering during cesarean section under spinal anesthesia however tramadol offers rapid onset, less recurrence and less sedation as a side effect when compared to pethidine.[13] Important to note is that low dose intravenous tramadol (0.5 mg/kg) controls shivering with low sedation scores which results in higher maternal–newborn bonding thus greater satisfaction.[14]

Tramadol has been noted to be as effective and sometimes better then pethidine in controlling perioperative shivering with fewer side effects during spinal anesthesia.[15,16] Prophylactic Intravenous administration of low-dose tramadol has proven to be effective in reducing the incidence and intensity of shivering in parturients undergoing cesarean section under spinal anesthesia.[17]

The respiratory effects of tramadol and pethidine were compared by Tarkkila *et al.,* who documented that comparable dose of tramadol did not lead to respiratory depression in contrast to pethidine

(0.6mg/kg)[18] therefore we considered the use tramadol for our study.

Mathew *et al.*,[19] demonstrated the effectiveness of tramadol for prevention of post operative shivering at doses of 1 and 2 mg/kg with respective success rates of 96% and 98%, which are in the same range as our result of 86.66% success rate with a dose of 1mg/kg.

Aditi A. Dhimar and others[10] noted tramadol and pethidine to be equally efficacious in controlling post anaesthetic shivering under regional anaesthesia but tramadol was more potent with respect to control of shivering and its recurrence. It was concluded that intravenous tramadol is qualitatively superior to pethidine for control of shivering same was also reflected in our study.

Wahid *et al.*,[20] compared tramadol with pethidine for controlling shivering during spinal anesthesia and found both equally effective, however pethidine took shorter time to control shivering comparative to tramadol. Fern *et al.*,[21] compared dexmedetomidine, pethidine and tramadol and found dexmedetomidine more effective than both pethidine and tramadol, both of which were equally effective in controlling post-spinal anesthesia shivering. Our study emphasizes these results in that tramadol is similarly effective as pethidine in controlling anaesthesia induced shivering.

CONCLUSION

We found tramadol to be a better alternative than pethidine in controlling anaesthesia induced shivering in elective caesarean section patients under spinal anaesthesia as it is readily available with less systemic side effects.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

SAA & MAK: Data acquisition, data analysis, critical review, approval of the final version to be published.

SA & HI: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AM & AA: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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