

To compare effect of warm and normal temperature fluids on shivering during caesarean section under spinal anaesthesia - A randomised control trial.

¹Dr. Sonali Dhawan, MD Anaesthesia, Senior Professor, Department of Anaesthesiology and Sardar Patel Medical College, Bikaner.

²Dr. Prashant Rassewat, MD Anaesthesia Student, Department of Anaesthesiology and Sardar Patel Medical College, Bikaner.

³Dr. Jinesh baid, MD Anaesthesia, Assistant Professor, Department of Anaesthesiology and Sardar Patel Medical College, Bikaner.

⁴Dr. Mohammed Yunus Khilji, MD Anaesthesia, Associate Professor, Department of Anaesthesiology and Sardar Patel Medical College, Bikaner.

⁵Dr. Kriti Soni, Intern, Dr. D. Y. Patil Medical Collage, Pune.

⁶Dr. Nalini singh, junior resident, Department of Anaesthesiology and Sardar Patel Medical College, Bikaner.

Corresponding Author: Dr. Prashant Rassewat, MD Anaesthesia Student, Department of Anaesthesiology and Sardar Patel Medical College, Bikaner.

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Abstract

Introduction: Shivering is one of the common problems with spinal anaesthesia and the incidence of shivering is greater than 55% after spinal anaesthesia. It causes discomfort and dissatisfaction in patients undergoing surgery. There are pharmacological (intra-thecal opioids e.g., fentanyl & i. v. administration of tramadol) and non-pharmacologic (acupoint stimulation, warm fluid therapy and covering with a warm blanket) methods for prevention and management of shivering. Our aim was to assess the impact of warm intravenous fluid as compared to normal temperature fluid on prevention of shivering during caesarean delivery under spinal anaesthesia.

Material & Methodology: We conducted a prospective double blinded randomized control study in 120 patients of ASA grade II, 18 to 40 years of age undergoing elective and emergency Caesarean section under spinal anaesthesia in Department of anaesthesia, S.P. Medical College and A.G. of Hospitals, Bikaner after taking approval from Institutional Ethical committee and valid written informed consent from patient and their close relatives.

Patients were divided equally into two groups of 60 each. Group WA patients were preloaded with 10 ml/kg IV fluid of ringer lactate solution stored in a warming cabinet at 38°C through fluid warmer just 15 min prior to spinal anaesthesia. Group WB patients were preloaded

with 10 ml/kg fluid of ringer lactate solution stored at room temperature just 15 min prior to spinal block. The patient's core temperature was measured by tympanic thermo meter. hypothermia is defined as lowering of core body temperature to $<36^{\circ}\text{C}$ Shivering incidence were noted intra operative and scores were given using the scale described by Crossley and Mahajan.

Results: In WB group 29 patients had shivering while in WA group 7 patients had shivering which on comparison was statistically significant (p-values < 0.005). Difference in mean Body temperature between Group WA and Group WB at intervals of 10 minutes after spinal anaesthesia to 60 minutes after spinal anaesthesia were significant (p-values < 0.005). The APGAR score was significantly higher in Group WA both at 1 minutes and 5 minutes. 88.33% of patients of Group WA and 51.66% of patients of Group WB had excellent maternal satisfaction score.

Conclusion: In our study, we conclude that the incidence of intra operative shivering was less and APGAR score at 1 and 5 minutes and maternal satisfaction score was higher with warm fluid infusion. Thus, warm fluid infusion is better than normal room temperature fluid infusion.

Keywords: Shivering, caesarean section, warm fluid

Introduction

Spinal anaesthesia is most common and safe technique as compared to general anaesthesia in caesarean section deliveries as spinal anaesthesia has certain merits such as rapid onset, high rate of success, easy to administer, less fetal side effects, and minimal maternal discomfort or adverse effects¹

Shivering is one of the common problems with spinal anaesthesia and the incidence of shivering is greater than 55% after spinal anaesthesia.^{2,3} It causes discomfort and dissatisfaction in patients undergoing surgery ranging

from a mild skin eruption to a severe form with generalized continuous skeletal muscle contractions. Shivering leads to an increase in catecholamine release, ICP (intra cranial pressure), IOP (intraocular pressure), oxygen consumption, tachycardia, hypertension, metabolic acidosis, coagulation disorders, disorder in the body's nitrogen balance, changes in drug effects, increased postoperative pain, and discomfort for the patient. The patho-physiology of shivering is not clearly understood, it may involve a combination of mechanisms, including modulation of thermoregulatory thresholds, changes in body heat distribution, reduction in body core temperature, and the cooling effect of the fluids injected into the neuron's axis.⁴

There are pharmacological and non-pharmacologic methods for prevention and management of shivering. Pharmacologic methods include intra-theal opioids e.g., fentanyl, sufentanil, or pethidine, & intravenous administration of tramadol, magnesium sulphate, and ketamine.^{5,6}

The non-pharmacological options include acupoint stimulation, warm fluid therapy and covering with a warm blanket.^{7,8}

This study proposes to assess the impact of warm intravenous fluid as compared to normal temperature fluid on prevention of shivering during caesarean delivery under spinal anaesthesia.

Material and Methodology

We conducted a prospective double blinded randomized control study in 120 patients of ASA grade II, 18 to 40 years of age undergoing elective and emergency Caesarean section under spinal anaesthesia in Department of anaesthesia, Sardar Patel Medical College and A.G. of Hospitals, Bikaner after taking approval from Institutional Ethical committee and valid written informed consent from patient and their close relatives.

Pregnant women in labour, with a fever, history of recent infection, multiple caesarean sections, history of hypertension, blood disorder and corresponding blood transfusion, inadequate block effect or partially effect of spinal anaesthesia which needs conversion to general anaesthesia were excluded from the study. We included total 120 patients divided equally into two groups. Group WA having 60 patients were given warmed intravenous fluids and Group WB having 60 patients were given normal room temperature intravenous fluids.

Pre-Anaesthetic check-up was done a day prior to surgery for elective cases and at recovery room for emergency cases which included a detailed history, complete general physical and systemic examination. Patient were kept nil by mouth for minimum 6-8 hours before surgery. Following arrival in the Anaesthetic room, pulse oximeter, NIBP, ECG were connected to the patients and baseline vital parameters were recorded. IV access was established. Group WA patients were preloaded with 10 ml/kg IV fluid of ringer lactate solution stored in a warming cabinet at 38°C through fluid warmer just 15 min prior to spinal anaesthesia. Group WB patients were preloaded with 10 ml/kg fluid of ringer lactate solution stored at room temperature just 15 min prior to spinal block. All the patients received 10 mg 0.5% bupivacaine (hyperbaric) injected intrathecally in left lateral position using 25 G Quincke spinal needle at L₃₋₄ inter-spinal spaces to achieve sensory blockade up to T5 level. Intraoperative Hypotension (>20% decrease in mean arterial pressure from baseline for one or more measurements) was treated with vasopressors (phenylephrine) and IV fluids. Intraoperative bradycardia (pulse rate < 50/min) was treated with inj. atropine 0.6 mgiv.

The patient's core temperature was measured by tympanic thermometer. In caesarean delivery, hypothermia is defined as lowering of core body temperature to <36°C

Shivering incidence were noted intra operative and scores were given. The intensity of Peri-Anaesthetic shivering was graded using the scale described by Crossley and Mahajan: 0 = No shivering; 1 = No visible muscle activity but piloerection, peripheral vasoconstriction, or both are present (other causes excluded); 2 = Muscular activity in only one muscle group; 3 = Moderate muscular activity in more than one muscle group but no generalized shaking; 4 = violent muscular activity that involves the whole body. If Shivering occurs, it was controlled by use of injection Tramadol 0.25mg/kg body weightiv.¹² APGAR score of infants was to be determined by paediatrician 1 min and 5 min after the birth of the child through caesarean section.

Statistical analysis

Descriptive statistics were used to summarize demographic and outcome data. Data were expressed as mean ± SD and numbers (%) appropriately. Independent sample *t*-test was used for two groups' comparisons. The categorical data were reanalyzed using a Chi-square test. P < 0.05 was considered statistically significant.

Results

The demographic parameters like age, weight and height of the study population in both groups. They were similar in both the groups, with no statistical differences. There were no significant variations in intraoperative and post operative mean pulse rate and mean Arterial Pressure in both the study groups.

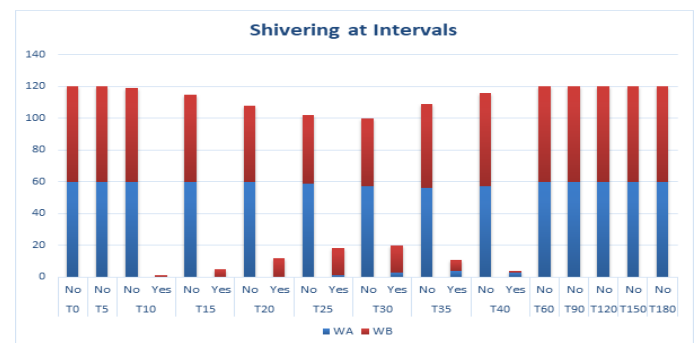


Chart 1: Comparison of shivering between two groups.

Chart 1 shows that shivering was reported by patients from 10 min post anaesthesia to 40 min post anaesthesia. We observed that number of patients who had shivering was more in WB than WA group. In WB group 29 patients had shivering. While in WA group 7 patients had shivering which on comparison was statistically significant. (p-values< 0.005). This shows that the shivering was experienced considerably more in patients who were given fluids at normal temperature as compared to patients given warmed fluids.

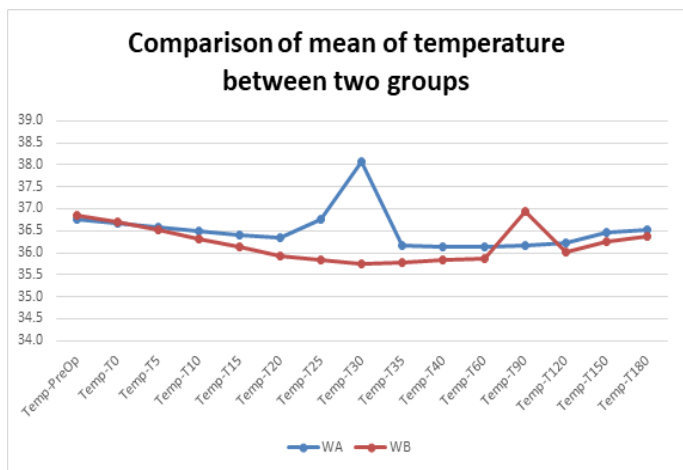


Chart 2: Comparison of mean of temperature between two groups.

We observed that (Chart-2) the baseline mean body temperature of both groups were comparable WA-36.755 WB-36.842 (p-value 0.133).

We observed that the difference in mean Body temperature between Group WA and Group WB at intervals of 10 minutes after spinal anaesthesia to 60 minutes after spinal anaesthesia were significant (p-values < 0.005). i.e group WB parturients experienced decrease in core body temperature more than group WA parturients. [Chart -2] Mean body temperature in Group WA and Group WB was 36.335 and 35.933, 36.177 and 35.772, 36.138 and 35.865 at Temp-T20, Temp-T35, Temp-T60 respectively. (p value- <0.001).

Table 1: Comparison of mean APGAR score at 1min and 5min between two groups.

Group	N	Mean	Std. Deviation	Std. Error Mean	p-value
APG AR - 1 min	WA	60	8.00	0.000	<0.001
	WB	60	7.50	0.504	
APG AR - 5 min	WA	60	9.83	0.376	<0.001
	WB	60	8.70	0.619	

In our study we observed that although APGAR score were normal in both groups but mean APGAR score at 1 min in Group WA is 8.00±0.00 and in Group WB is 7.50±0.5 and at 5 min in Group WA is 9.83±0.37 and in Group WB is 8.70±0.61. The APGAR score was significantly higher in Group WA both at 1 minutes and 5 minutes (p<0.001, p<0.001 respectively). [Table 1]

Table 2: Comparison of Patient Satisfaction post anaesthesia between two groups

	Group		Total
	WA	WB	
Patients' satisfaction score			
Excellent	53	31	84
Good	7	29	36
Total	60	60	120

Group	WA	WB
Excellent	88.33%	51.66%
Good	11.66%	48.33%

Table 2 shows 88.33% of patients of Group WA and 51.66% of patients of Group WB had excellent maternal satisfaction score, whereas 11.66% of the patients in Group WA and 48.33% of the patients in Group WB had good maternal satisfaction score. Maternal satisfaction score was based on intra operative and post operative thermal comfort and grading of shivering and patient's feedback.

Discussion

There are three main reasons that are responsible for causing hypothermia following administration of spinal anaesthesia. First, spinal anaesthesia causes heat redistribution from core to the periphery. Second, lack of vasoconstriction affects thermoregulation beneath the level of spinal block that causes increase in loss of heat from the body. The third reason is the altered mechanism of thermoregulation during spinal anaesthesia resulting in 0.5°C decrease in temperature, below the threshold level of Vaso-constriction and shivering.⁹ Prevention of shivering is important to avoid intra-operative and post-operative complications.

There are commonly two strategies to control post anaesthesia shivering Pharmacological and Non pharmacological anti shivering methods. Many drugs have been shown to be effective on the prevention and treatment of Post Anaesthetic Shivering, such as opioids, α_2 -agonists, anti cholinergics, central nervous system stimulants, corticosteroids. Non pharmacological methods work by preserving or restoring the body temperature above the shivering threshold or by masking the central shivering reflex via warmed skin sensory input.¹⁰ Active cutaneous warming (electric heating, water-circulating garments, forced-air, radiant heating) is effective in the shivering management in the perioperative and induced hypothermia settings. In contrast, evidence suggests that passive cutaneous warming (cotton blanket, elastic bandage) and body core warming (heated fluid, heated air) are of limited benefit at best.¹⁰

As shown in chart 1, we observed that number of patients who had shivering was more in WB than WA group. In WB group 29 patients had shivering while in WA group 7 patients had shivering which on comparison was statistically significant. (p-values < 0.005). This shows that the shivering was experienced considerably more in

patients who were given fluids at normal temperature as compared to patients given warmed fluids. Study done by V.S. Meghna et al (2020)¹¹ showed, there was statistically significant lower incidence of shivering on administration of warm intravenous fluid infusion along with use of forced air warmers as compared to use of forced air warmer only which was similar to our study.

Similar Study done by Chung SH et al (2012)¹² showed that the incidence of shivering was significantly less in group A (forced air pre-warming) and group F (intravenous warmed fluids) compared to group C(Control) (p=0.035).

Our results were similar to the study conducted by Tingtingni et al (2020)¹³ in which the incidences of shivering were 56.3% in the control group and 19.1% in the intervention group during the surgical procedure (P<0.001), and the shivering assessment scores were higher in the control than in the intervention group. In our study we observed that the difference in mean Body temperature between Group WA and Group WB at intervals of 10 minutes after spinal anaesthesia to 60 minutes after spinal anaesthesia were significant (p-values < 0.005). i.e group WB parturients have more hypothermia than group WA parturients.

Study done by Sultan P et al (2015)⁷ found that fall in temperature was significantly less in the warmed fluid group compared with the control group (P<0.00001), which correlates with the results found in our study. We observed that although APGAR score were normal in both groups but mean APGAR score at 1 min in Group WA is 8.00±0.00 and in Group WB is 7.50±0.5 and at 5 min in Group WA is 9.83±0.37 and in Group WB is 8.70±0.61. The APGAR score was significantly higher in Group WA both at 1 minutes and 5 minutes (p<0.001, p < 0.001 respectively). Our study was similar to study done by Canturk M et al (2019)²³ who observed that

Apgar scores at 1st and 5th minute were significantly higher in warm iv infusion (warm group) ($p = 0.006$ and $p = 0.045$ respectively).

In our study 88.33% of patients of Group WA and 51.66% of patients of Group WB had excellent maternal satisfaction score, whereas 11.66% of the patients in Group WA and 48.33% of the patients in Group WB had good maternal satisfaction score. Maternal satisfaction score was based on intra operative and post operative thermal comfort and grading of shivering and patient's feedback. Study conducted by Ting tingni et al (2020)²⁶ also had result similar to our study. They found that Thermal comfort scores were higher in intervention group than in the control group. ($p=0.002$).

Conclusion

We concluded that the incidence of intra operative shivering was less while APGAR score at 1 and 5 minutes and maternal satisfaction score was higher with warm fluid infusion. Thus, warm fluid infusion is better than normal room temperature fluid infusion. However, a larger and multicentric study is needed to establish the above said facts.

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