



EFFECTIVENESS OF ADMINISTERING WARM INFUSION FLUIDS AGAINST SHIVERING OCCURRENCE IN PATIENTS SECTION CAESAREA WITH SPINAL ANESTHESIA

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ABSTRACT

Shivering is a common postoperative issue that can exacerbate patient discomfort and hinder recovery. This study aims to evaluate the effectiveness of administering warm intravenous fluids in reducing shivering incidence in patients undergoing cesarean section (SC) with spinal anesthesia at RSUD Dr. Soekardjo, Tasikmalaya, Indonesia. Using a quasi-experimental design with a pretest-posttest control group model, 60 patients were divided into two groups: an experimental group receiving warm intravenous fluids and a control group receiving warm blankets. The study employed non-probability purposive sampling, dividing a total of 60 respondents into two groups: the experimental group (n = 30) and the control group (n = 30). An observation sheet for research instruments. The results of this study were tested using univariate analysis and bivariate analysis, specifically the Mann-Whitney U Test. Results indicate that warm intravenous fluids are significantly more effective in reducing shivering compared to warm blankets, with a p-value of 0.000 ($p < 0.05$) in the Mann-Whitney test. This finding suggests that the use of warm intravenous fluids can improve patient comfort and accelerate postoperative recovery.

Kata kunci: cesarean section; postoperative recovery; shivering; spinal anesthesia; warm intravenous fluids

How to cite (in APA style)

Kurniawan, A., Novitasari, D., & Burhan, A. (2024). Effectiveness of Administering Warm Infusion Fluids Against Shivering Occurrence in Patients Section Caesarea with Spinal Anesthesia. *Indonesian Journal of Global Health Research*, 6(5), 3165-3174. <https://doi.org/10.37287/ijghr.v6i5.4364>.

INTRODUCTION

Section caesarea (SC) is a surgical procedure performed to deliver the fetus through an incision in the abdominal wall and uterus when vaginal delivery is not considered safe or possible. This surgery is usually performed using regional anesthesia techniques, especially spinal anesthesia. This technique involves injecting a local anesthetic into the spinal fluid around the spine to block pain in the lower part of the body during the procedure. Although spinal anesthesia is generally considered safe and effective, the use of this technique can still cause several complications, one of which is shivering (Morgan & Mikhail, 2013).

Shivering is a body reaction that frequently occurs after spinal anesthesia, when the body tries to regulate its internal temperature. These symptoms can cause significant discomfort for the patient, worsen the postoperative condition, and add challenges to the recovery process. Shivering can increase the body's metabolism and oxygen consumption, leading to hypoxemia, lactic acidosis, and postoperative pain. Furthermore, other effects of shivering include increased intraocular and intracranial pressure, as well as interference with monitoring monitors (U. S. Prasetyo et al., 2017). Globally, the incidence of SC has increased rapidly. The World Health Organization (WHO) determines that the SC rate should ideally be around 10-15% of total births. However, currently this figure has exceeded 20% of all births in various countries (WHO, 2019). In Indonesia, the prevalence of SC varies greatly between government and private hospitals. Government hospitals report SC rates of around 20-25%,

while in private hospitals the figure can reach 30-80% of total births (M. Hayati et al., 2015). These data reflect differences in medical policies and practices across health facilities.

Shivering is a common issue with both regional and general anesthesia. Treatment of shivering after SC surgery involves both external and internal warming methods. External warming methods such as warm blankets and internal methods such as heated IV fluids have been proven to be effective in reducing the incidence of shivering. Research in various hospitals shows that warm intravenous fluids can significantly reduce the incidence of shivering compared to traditional methods (Aprianti et al., 2022). According to pre-survey data at Dr. Soekardjo Tasikmalaya City Hospital, the incidence of shivering in patients undergoing SC with spinal anesthesia is still quite high. Of the 27 patients studied, 15 experienced shivering. This shows the need for a more effective approach in treating shivering, such as the use of warm intravenous fluids, which is expected to increase patient comfort and speed up the post-operative recovery process. This study aims to evaluate the effectiveness of administering warm intravenous fluids in reducing the incidence of shivering in SC patients with spinal anesthesia at Dr. Soekardjo Tasikmalaya City Hospital, as well as providing better insight into the safer and more effective treatment of shivering.

METHOD

Utilizing a pretest-posttest control group model and a quasi-experiment design, this study assessed the efficacy of warm intravenous fluids in avoiding shivering in patients undergoing caesarean sections under spinal anesthesia. The research was carried out at the Central Surgical Installation of Dr. Soekardjo Tasikmalaya City Hospital from 30 March 2024 to 30 April 2024. The study population included patients aged 17 to 45 years who underwent caesarean section surgery with regional anesthesia at Dr. Soekardjo Tasikmalaya City Hospital, with an average monthly population of 54 patients and physical status ASA I and II. Samples were drawn from this cohort based on the following inclusion criteria: ASA physical status I or II and age range of 17-45 years. Patients with a history of systemic illness, infectious diseases, or those hospitalized to the intensive care unit following surgery were excluded. Purposive sampling was used to gather samples, which were then split into two groups: the experimental group, which received warm IV fluids, and the control group, which received heated blankets. A total of 60 patients made up the samples, with 30 individuals in each group as defined.

The delivery of warm intravenous fluids is the independent variable, while the incidence of shivering is the dependent variable. These two variables make up the research variables. The operational definition of variables includes warm infusion fluids given at a temperature of 37°C using an infusion warmer, shivering, which is measured by the degree of shivering using a shivering assessment sheet, patient age, body mass index (BMI), and ASA physical status before surgery. The research instrument includes an observation sheet to observe shivering incidents and a checklist sheet to record data from the observation sheet. Data were collected through interviews in the operating room preparation room to obtain patient consent and observation in the recovery room after surgery. Enumerators assist the data collection process according to predetermined procedures. Data processing involves several steps, starting from collecting data through prepared instruments, editing data to ensure clarity and completeness, to coding information to categorize information according to the variables studied. The data was then tabulated into research tables and described using frequency tables and diagrams to understand the characteristics of the sample. To ascertain whether there are noteworthy distinctions between the experimental group and the control group, hypothesis testing is done. The features of the variables were described using univariate analysis, and the

efficacy of giving warm intravenous fluids to prevent shivering was assessed using bivariate analysis utilizing the Wilcoxon test and the Mann-Whitney U test.

RESULTS

Respondent Characteristics

The age, ASA status, and BMI distributions in the intervention and control groups are displayed in Table 1.

Table 1.
The age, ASA status, and BMI distributions

Variables	Intervention Group (n=30)		Control Group (n=30)	
	Sum	Percentage	Sum	Percentage
Age				
– <20 years	0	0	0	0
– 20-35 years	20	66.7	20	66.7
– >35 years	10	33.3	10	33.3
ASA Status				
– ASA I	0	0	0	0
– ASA II	30	100	30	100
BMI				
– <18.5 kg/m ²	4	0	6	0
– 18.5-25.0 kg/m ²	26	13.3	24	20
– >25.0 kg/m ²	0	86.7	0	80

In the intervention group, most respondents were aged 20-35 years (66.7%) and had ASA II status (100%). Most BMI values were >25.0 kg/m² (86.7%). In the control group, the characteristics of age, ASA status, and BMI were similar to those of the intervention group.

Degree of Shivering

Table 2.

The distribution of pre- and post-test scores for the degree of shivering in the control and intervention groups

Degree of Shivering	Intervention Group (n=30)		Control Group (n=30)	
	Sum	Percentage	Sum	Percentage
Pre-test				
– Degree 0	0	0	0	0
– Degree 1	0	0	0	0
– Degree 2	0	0	0	0
– Degree 3	14	46,7	14	46,7
– Degree 4	16	53,3	16	53,3
Post-test				
– Degree 0	0	0	0	0
– Degree 1	3	10	2	6,7
– Degree 2	10	33,3	10	33,3
– Degree 3	11	36,7	12	40
– Degree 4	6	20	6	20

At the pre-test, the intervention and control groups had the highest degree of shivering at grade 4 (53.3%). At post-test, the intervention group mostly experienced grade 3 shivering (36.7%), while the control group experienced grade 3 shivering (40%).

Test differences within groups

Table 3.
Wilcoxon test results in groups:

Ranks	N	Mean Rank	Sum of Ranks	Z	Asymp. Sig. (2-tailed)
Intervention Group					
– Negative Ranks	20	10.50	210.00	-4.099	0.000
– Positive Ranks	0	0.00	0.00		
– Ties	10				
Control Group					
Negative Ranks	19	10.00	190.00	-4.021	0.000
Positive Ranks	0	0.00	0.00		
Ties	11				

Wilcoxon test

p-value 0.000 ($p < 0.05$), suggesting a significant difference between the intervention and control groups' pre- and post-test scores.

Test differences between the two groups

Table 4.
Mann-Whitney test results between the two groups:

Groups	Mean	Z	Sig.
Intervention Group	38.30	-3.720	0.000
Control Group	22.70		

Mann-Whitney test

The statistical Z value is -3.720, with a p-value of 0.000 ($p < 0.05$), indicating a significant difference between the two research groups. Giving warm intravenous fluids is more effective in preventing shivering than warm blankets.

DISCUSSION

Age

Based on a total of 40 respondents—20 in the intervention group and 20 in the control group—the research findings show that patients undergoing cesarean sections who shiver are primarily between the ages of 20 and 35. Consistent with earlier studies showing that the majority of patients undergoing cesarean sections are between the ages of 20 and 35 (Nuraeni *et al.*, 2024). This is also in line with the research conducted by Ruspita & Rosyidah (2022), where most of the participants were in the age range of 20-35 years. This finding is further supported by the study by Surmayanti *et al.*, (2022), which found that the highest number of respondents by age was in the 20-35 year group (not at risk), with a total of 56 respondents (64.4%). The majority of respondents are pregnant within the healthy reproductive age range of 20–35 years, according to research by Juliathi *et al.*, (2021), which is consistent with another study that notes that the age group of 20–35 years is where the greatest number of patients undergoing cesarean surgery is. According to Octasari *et al.*, (2022), women who are between the ages of 20 and 35 are most likely to have a physically and psychologically good pregnancy. A woman is considered to be at a healthy reproductive age if she becomes pregnant between the ages of 20 and 35. Reproduction is safe at that age, and if a woman takes good care of her reproductive organs and feels safe doing so, she can conceive safely and healthily. This results from the mother's age during pregnancy, which has a major impact on the birth weight of the child (Pinontoan & Tombokan, 2015).

Physical status (ASA)

The results of the research showed that all patients had an ASA II physical status, both in the intervention group and the control group. This finding is consistent with previous research indicating that patients experiencing post-cesarean shivering are predominantly ASA II patients, accounting for 67.4% (Prasetyo et al., 2023). In line with the research conducted by Fitria *et al.*, (2018), the largest group of respondents was ASA II, comprising 22 respondents (55%). This finding is also supported by the study by Negoro *et al.*, (2024), which showed that the majority of respondents were in ASA II, totaling 38 individuals (76%). It also aligns with earlier studies, which indicated that the majority of respondents experiencing post-cesarean shivering were ASA II, at 27.4%. The researchers assume that the majority of cesarean patients at RSUD DR Soekardjo in Tasikmalaya are in optimal condition, as evidenced by the fact that 100% of patients are ASA II. ASA II status in pregnant patients represents the lowest physical status in the ASA classification. This is not in line with the findings of the research conducted by (Supriadi, 2022), which indicated that the majority of respondents had ASA status I, totaling 50 individuals (62.5%). The SC operation with spinal anesthesia needs to be carefully considered during the pre-operative phase; the anesthesiologist and anesthesia technician must optimize the patient's condition, as this improvement will impact the ASA physical status.

BMI value

The results of the research conducted on the characteristics of BMI showed that patients with a BMI range >25.0 kg/m² experienced the most, with 26 respondents in the intervention group and 24 respondents in the control group. In line with previous research that found that the majority of SC patients have a BMI > 25 – 27 kg/m², there were 4 respondents, or 57.1% (Hayati, 2018). This result is supported by the findings of Supriadi (2022), which indicate that the most common BMI among respondents is obesity, with 66 individuals (82.5%). According to Guyton, an individual's metabolism varies, with body size, which includes height and weight assessed through body mass index. This is a factor that can influence metabolism and impact thermoregulation (Supriadi, 2022). According to Ganong, when humans are in an environment with a temperature lower than their body temperature, they will continuously generate internal heat to maintain their body temperature. The formation of heat depends on the oxidation of metabolic fuels derived from food and fat as energy sources for heat production (Mubarokah, 2017). Shivering is also caused by spinal anesthesia, which affects the three elements of thermoregulation: the afferent input element, the central signal regulation, and the efferent response. Spinal anesthesia can also stop the body from adapting and mess up the way fat and skin work to control body temperature by changing the threshold for responses like shivering, sweating, and narrowing of blood vessels (Ruskandi, 2022). In theory, people with a low Body Mass Index have thin fat and easily lose heat because the fat reserves in the body are small, so this can trigger shivering in patients with spinal anesthesia. This is not in line with previous studies, which found that patients who experience shivering are mostly normal BMI patients (Prasetyo et al., 2023).

Degree of Shivering

Shivering intensity both before and after warm IV fluids are administeredThe study done by respondents with a pre-test value of the degree of shivering in the intervention group revealed that up to 16 respondents had the most experienced shivering grade 4. There were up to 11 responders in the intervention group who had a post-test value for the degree of shivering. According to earlier research by Cahyawati et al., (2019), patients in the intervention group experienced considerably less shivering when warm intravenous fluids (37°C) were administered (p value <0.05). Supported by the research findings of Nasiri et al., (2015), where the administration of warm infusion fluids effectively reduces shivering and suggests

combining it with warm, humid oxygen. Intravenous fluids that are warm can reduce heat loss and provide further benefits by replacing lost fluid. Furthermore, fluid treatment can lessen hemodynamic problems following surgery. Warm intravenous fluids are also said to have the benefit of preventing moms undergoing cesarean sections from losing their core body temperature and to lessen shivering during spinal anesthesia (Cobb et al., 2016).

Degree of shivering before and after giving a warm blanket Respondents with a pre-test shivering degree value in the control group experienced the most shivering degree, as many as 16 respondents. Respondents with a post-test shivering degree value in the control group were the most grade 3, as many as 12 respondents. In line with research conducted by Supriadi (2022), there was a change in the degree of shivering after giving a regular blanket, with the results obtained from 40 respondents who experienced shivering degrees 1, 2, and 3 after treatment to degree 0 as many as 25 respondents (62.5%) and degree 1 as many as 15 respondents (37.5%). A regular blanket only wraps and protects the patient from more severe heat loss; warming relies on heat from within the body. The blanket only helps prevent the release of heat produced in the body, and there is no heat transfer from the regular blanket into the patient's body Supriadi (2022).

Difference in values before and after administration of warm infusion fluids.

The results of the Wilcoxon test with signed ranks showed a calculated Z value of -4.099 and a p-value (sig. (2.tailed) produced) of 0.000 ($p < 0.05$). Thus, H_0 was rejected and H_a was accepted, meaning there was a difference between the pre-test and post-test values in the intervention group. So it can be concluded that the administration of warm infusion fluids is effective in treating shivering after spinal anesthesia in caesarean section patients. In line with research conducted by Negoro et al., (2024), which stated that the use of warm infusion fluids is effective in preventing shivering in post-caesarean section patients. This is because administering warm infusion fluids can suppress the loss of body heat caused by vasodilation after spinal anesthesia. According to Maulana (2018) research, administering warm infusion fluids can prevent shivering in caesarean section patients with spinal anesthesia.

Differences in values before and after giving warm blankets

After using signed ranks in the Wilcoxon test, the computed Z value was -4.021, and the p-value (sig. (2.tailed) generated) was 0.000 ($p < 0.05$). Consequently, H_0 was turned down while H_a was approved, indicating that the control group's pre- and post-test values differed. We conclude that post-spinal anesthesia shivering in individuals who have had cesarean sections can also be effectively treated with heated blankets. In line with previous studies that obtained negative rank results in the cotton blanket group of 21 and positive rank of 3, which means that in the cotton blanket intervention group there were 21 people who experienced a decrease in the degree of shivering and 3 people who experienced an increase in the degree, while for respondents who did not experience a change in degree, there were 7 respondents (Afer et al., 2021). Also in line with research conducted by Maulana (2018), cotton cloth obtained a p value of 000 < 0.05 , meaning that giving a warm blanket has an effect on increasing the body temperature of postoperative patients. By retaining heat through conduction, this blanket helps reduce heat loss. Conduction is heat that travels from one substance to another through direct contact. When skin that has a higher temperature touches a cooler substance, heat will transfer. When the temperatures of the two objects are the same, conductive heat loss stops. Blankets can also protect the patient's body, especially the skin, by acting as a temperature receptor from the environmental conditions of the recovery room (Zang, 2012).

Differences in post-treatment values in the intervention group and the control group

The mean post-test value in the intervention group was 38.30, and the mean post-test value in the control group was 22.70, according to the Man Whitney test. The Z statistic value obtained in the two groups was -3.720 with a p-value of 0.000 ($p < 0.05$). Thus, H_0 was rejected and H_a was accepted, meaning that there was a significant difference between the two research groups. This means that there is a difference in the effect of administering warm IV fluids with warm blankets on handling shivering in post-spinal anesthesia caesarean section patients. In line with research conducted by Qona et al., (2019), with the results of warm fluid therapy being more effective than warm blankets on increasing the body temperature of postoperative patients. These results are not in line with research conducted by Maulana (2018), with a p value of 0.000 < 0.05 , meaning that administering warm fluid therapy and warm blankets has an effect on increasing the body temperature of postoperative patients, and there is no difference in the values of the two groups.

Effectiveness of Warm Infusion Fluids on Shivering in Caesarean Section with Spinal Anesthesia

Based on the research conducted, a p-value of 0.000 ($p < 0.05$) was obtained, indicating that the alternative hypothesis (H_a) of this study was accepted. This means that the administration of warm infusion fluids is effective in preventing shivering in Caesarean section patients with spinal anesthesia at Dr. Soekardjo Regional Hospital, Tasikmalaya City. Another study was conducted by Nayoko (2016), which found that the administration of warm infusions was effective in preventing and treating shivering in CS patients. This is also in line with research conducted by (Qona et al., 2019), which stated that the administration of warm infusions is more effective in reducing shivering after spinal anesthesia compared to the administration of warm blankets. Administering warm intravenous fluids can reduce the loss of thermoregulation, resulting in changes in body temperature. Warm intravenous fluids will later enter the blood vessels and then be distributed throughout the body. The increase in temperature that occurs will stimulate the hypothalamus to activate the thermoregulatory response with vasoconstriction to prevent further body heat from being lost to the environment. Vasoconstriction will maintain core temperature, and with increased heat production, the metabolic rate will increase (Pudianto et al., 2023).

CONCLUSION

This study reveals that the majority of respondents' age characteristics range from 20 to 35 years, with the majority having ASA II status and a BMI $> 25.0 \text{ kg/m}^2$. The study's results revealed that the degree of shivering before administering warm intravenous fluids and warm blankets was at most degree 4. After the intervention, the degree of shivering decreased to degree 3 in both groups. Statistical analysis shows that there is a significant difference between the pre-test and post-test scores in the intervention and control groups, with a p-value of 0.000 ($p < 0.05$), respectively. Warm intravenous fluids were significantly more effective in reducing shivering than warm blankets, as demonstrated by the Mann-Whitney test results with a p-value of 0.000 ($p < 0.05$).

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