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A Pre Experimental Study: The Effect of Blanket Warmers on Increasing Temperature in Post Caesarean Section Hypothermia Patients

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ABSTRACT

Background: Caesarean section is one of the most frequently performed surgical procedures, commonly using spinal block anesthesia. One of the common side effects of spinal anesthesia is hypothermia.

Purpose: The aim of this study was to analyze the effect of using a blanket warmer on increasing body temperature in post caesarean section patients experiencing hypothermia following spinal anesthesia.

Methods: This study employed a pre-experimental design with a pre-posttest approach. The population consisted of all caesarean section patients undergoing spinal anesthesia, totaling 23 individuals. The sampling technique used was non-probability purposive sampling, with a final sample size of 23 patients. Data collection was carried out using observation sheets. Statistical analysis was performed using the paired sample t-test.

Results: The findings showed that the mean body temperature before intervention of the blanket warmer was 36.10 °C, and after the intervention, the mean temperature increased to 36.67°C. The paired sample t-test revealed a statistically significant difference with a p-value of 0.000, which is lower than the significance level of $\alpha = 0.05$.

Conclusion: Blanket warmer significantly increases body temperature in post caesarean section patients receiving spinal block anesthesia. Blanket warmers are effective in addressing hypothermia as they provide controlled heat transfer, allowing patients with hypothermia to absorb heat from the device.

Keywords: Body Temperature, Blanket Warmer, Caesarean Section

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BACKGROUND

Sectio Caesarea is one of the most commonly performed surgical procedures in modern medicine. It has become a routine procedure associated with very low morbidity and mortality. The prevalence of caesarean section has been increasing globally due to a wide range of maternal and fetal indications. According to the World Health Organization (WHO), the rate of caesarean section in developing countries over the past 30 years has reached 10–15% of all births worldwide (WHO, 2015). The Obstetric Anesthesia Guidelines recommend spinal anesthesia as the preferred technique for caesarean section ("Practice Guidelines for Obstetric Anesthesia: An Updated Report by the American Society of Anesthesiologists Task Force on Obstetric Anesthesia and the Society for Obstetric Anesthesia and Perinatology," 2016). One of the side effects of spinal anesthesia is hypothermia (Liu & Qi, 2021).

The WHO has established a standard caesarean section rate of approximately 5–15%. However, data from the WHO's Global Survey on Maternal and Perinatal Health in 2011 indicated that 46.1% of births were performed caesarean section (WHO, 2021). In Indonesia, according to the 2023 RISKESDAS report, 17.6% of deliveries were conducted through caesarean section, indicating a rise above the WHO-recommended threshold (Kemenkes, 2018). The same report showed that caesarean section rate in East Java Province in 2020 was 3,401 surgeries out of 170,000 births, accounting for approximately 20% (Dinkes, 2011). WHO data also reported that the incidence of hypothermia among caesarean section patients receiving spinal anesthesia ranges from 20% to 70% during the perioperative period (Liu & Qi, 2021). Research found that 29-54% of caesarean section patients experienced postoperative shivering as a complication of hypothermia, which may affect multiple organ (Kumar et al., 2022).

Spinal anesthesia causes vasodilation, facilitating the redistribution of core body heat to the periphery and lowering the shivering threshold. This redistribution process plays a central role in the reduction of core body temperature. As a compensatory mechanism, muscle activity is stimulated to generate heat through shivering, thereby maintaining thermal homeostasis. In caesarean section patients, shivering represents the body's compensatory response to hypothermia (Amsalu et al., 2022). When heat production and heat loss are in balance, the body maintains thermal equilibrium. However, if this balance is disrupted, core temperature may increase or decrease significantly. Hypothermia is a medical emergency that occurs when heat loss exceeds heat production. As body temperature drops, the nervous system and other organs begin to malfunction. If not promptly treated, hypothermia may lead to adverse physiological effects, including impaired coagulation, increased blood loss, surgical site infection, myocardial ischemic events, altered drug metabolism, prolonged postoperative recovery, and delayed discharge from the post-anesthesia care unit (Rauch et al., 2021).

Several factors can contribute to hypothermia in surgical patients, including techniques of anesthesia (Pu et al., 2022). Anesthetic agents suppress oxidative metabolism, reducing endogenous heat production. Additional contributing factors include low ambient temperature in the operating room, the extent of surgical wounds, intraoperative fluid administration, patient age, body mass index (BMI), sex, type and duration of surgery—all of which may increase the risk of hypothermia during Cesarean delivery (Pu et al., 2022; Rauch et al., 2021).

Prevention of hypothermia can be achieved through passive external warming techniques, such as replacing wet clothing with dry, warm garments or blankets (Bennett & Holcomb, 2017). Managing hypothermia during and after anesthesia is critical due to the potential complications it may cause. Postoperative hypothermia can be treated pharmacologically using agents such as opioids and non-opioids, including pethidine, tramadol, clonidine, and meperidine. However, these drugs may cause side effects such as nausea, vomiting, and respiratory depression. Non-pharmacological interventions to prevent

perioperative hypothermia include active and passive warming strategies, such as warmed intravenous fluids, forced-air warming blankets, warming mattresses, radiant heating devices, and maintaining an appropriate operating-room temperature. These interventions help preserve maternal core body temperature and reduce the incidence of perioperative hypothermia and shivering during caesarean delivery (Zhuo et al., 2022). This study aimed to examine the effect of blankets warmers to increase body temperature. Although the effectiveness of blanket warmers has been reported previously (Işıklı & Fındık, 2022), evidence from Indonesian hospital settings, particularly among post-caesarean section patients receiving spinal anesthesia in our institution, remains limited also postoperative hypothermia remains a frequent nursing problem in the recovery room. Based on preliminary observations, most patients receive passive warming using cotton blankets, whereas active warming devices such as blanket warmers are not routinely implemented because of limited availability and the absence of standardized nursing protocols. Therefore, this study was conducted to provide local evidence regarding the effectiveness of blanket warmer use in routine clinical practice.

OBJECTIVE

The objective of this study is to examine the effect of blanket warmer use on increasing body temperature in post caesarean section patients with hypothermia.

METHODS

The method used in this study was a pre-experimental one-group pretest–posttest design. Body temperature was measured before and after the intervention. This design allowed the researchers to assess changes in body temperature caused by the use of a blanket warmer within the same group of participants. The population consisted of 23 post caesarean section patients who had undergone spinal anesthesia in the recovery room of Bhakti Dharma Husada General Hospital during July 2025. The sample size was determined using a total sampling approach based on the number of eligible post-caesarean section patients admitted to the recovery room during the study period. Participants were selected using purposive sampling. Patients were included in the study if they met the following criteria: (1) Post caesarean section patients experiencing hypothermia or exhibiting signs of shivering, (2) Patients who received spinal anesthesia, (3) Fully conscious, and (4) Willing to participate. Patients in emergency conditions requiring immediate medical intervention were excluded from the study.

The independent variable was the use of a blanket warmer, while the dependent variable was body temperature. A digital thermometer was used to measure temperature, and an observation sheet was used to document the application of the blanket warmer. To minimize measurement bias, body temperature was measured using the same digital thermometer, at the axillary, by trained researcher following a standardized measurement protocol. Temperature measurements before and after the intervention were performed under similar environmental conditions and by the same person. The blanket warmer used in this study was an electrically powered warming blanket designed to raise body temperature and counteract hypothermia. The specific type used was a full-body Warm Touch blanket set to 44°C and applied for 60 minutes in the recovery room. The dependent variable, temperature, was defined as the body temperature measured using a digital axillary thermometer. The data scale used was ratio. Temperature measurements were taken and recorded before (pretest) and after (posttest) the blanket warmer intervention. Observations were conducted by trained staff following a consistent protocol to minimize inter-observer bias.

Data were analyzed using SPSS version 23.0. Univariate analysis described the demographic characteristics of participants (age, occupation, and education) using frequency distributions. Bivariate analysis used a paired t-test to assess differences in body temperature

before and after the intervention. A significance level of $p < 0.05$ was used. Normality of the pre–post temperature differences was assessed using the Shapiro–Wilk test before conducting the paired t-test. The data were normally distributed ($p > 0.05$); therefore, the paired t-test was considered appropriate.

This study involved human participants, ethical compliance was essential. Key ethical issues addressed included obtaining informed consent, ensuring participant privacy, maintaining data confidentiality, and minimizing any potential physical or psychological distress during data collection. The study was reviewed and approved by the Research Ethics Committee of Stikes Hang Tuah Surabaya. This study, which has the number PE/53/VII/2025/KEP/SHT, satisfies the ethical feasibility standards.

RESULTS

Descriptive data were used to describe the characteristics of respondents based on age, occupation, and education**.**

Table 1. Characteristics of Research Respondents

Characteristics	Frequency	Percentage
Age		
20-26 years	1	4.3
27-33 years	9	39.1
>34 years	13	56.5
Education		
Elementary school	2	8.7
Junior high school	5	21.7
Senior high school	16	69.6
Occupation		
Housewife	18	78.3
Employes	5	21.7

Based on descriptive data from the respondent characteristics table 1, it can be concluded that Most respondents were over 34 years old (56.5%), followed by respondents aged 27-33 years (39.1%). Respondents education was dominated by senior high school (69.6%) and Junior high school (21.7%). Majority of respondents are Housewife (78.3).

Table 2. Temperature, Paired t-test Results in Caesarean Section Patients After Blanket Warmer Intervention

Number	Temperature Pretest	Temperature Posttest	P Value
1	36.4	36.6	0.000
2	36.3	36.6	
3	36.3	36.8	
4	36.3	36.8	
5	36.1	36.3	
6	36.3	36.5	
7	36.2	36.5	
8	35.9	36.5	

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9	35.9	36.8
10	35.5	36.4
11	35.7	36
12	36.3	36.6
13	36.3	37
14	35.8	36.5
15	36.4	37.4
16	36.3	36.9
17	36.4	36.8
18	36	36.6
19	36.2	36.3
20	36.2	36.7
21	35.8	37.5
22	35.6	36.7
23	36.2	36.7
Mean (SD)	36.10 (0.27)	36.67 (0.32)

Based on Table 2 showed that the mean body temperature of postoperative patients before the intervention of the blanket warmer was 36.10°C, while the mean temperature after the intervention was 36.67°C. The statistical analysis using the paired sample t-test yielded a significance value (p) = 0.000, which is less than α = 0.05, indicating that the hypothesis was accepted. It can be concluded that there is a significant effect of blanket warmer use on increasing body temperature in post Caesarean Section patients who received spinal anesthesia in the recovery room.

Table 3. Comparison of Body Temperature Before and After the Intervention

Variable	Pre-test Mean ± SD	Post-test Mean ± SD	Mean Difference	Effect Size (Cohen's d)	p-value
Body temperature (°C)	36.10 ± 0.27	36.67 ± 0.32	0.56 ± 0.36	1.556	<0.001

As shown in Table 3, the mean body temperature increased from 36.10 ± 0.27 °C before the intervention to 36.67 ± 0.32°C after the intervention. The intervention resulted in a mean increase of 0.62 ± 0.11°C, and this change was statistically significant ($p < 0.001$). The calculated effect size was 1.556, indicating a large practical effect according to Cohen's criteria (Cohen, 2013).

DISCUSSION

The statistical analysis using a paired sample t-test showed a significance value (p) = 0.000, which is less than α = 0.05, indicating that the hypothesis was accepted. The effect size was large (effect size was 1.556). This result demonstrates a significant effect of blanket warmer use on the increase in body temperature among post caesarean section patients under spinal anesthesia in the recovery room. The use of blanket warmers in postoperative patients who received spinal anesthesia was found to be highly effective. It is a non-pharmacological nursing intervention that is free from side effects, cost-effective, and easy to apply. Development of more advanced blanket warmer devices is needed to further enhance effectiveness in managing postoperative shivering due to regional anesthesia.

Hospitals are encouraged to establish standard operating procedures for the non-pharmacological application of warming blankets. Post caesarean section patients who undergo spinal anesthesia experience body temperature changes due to the use of blanket warmers, as these devices generate heat both internally and externally, thereby accelerating the increase in core body temperature (Al-Dardery et al., 2023). Blanket warmers that utilize electric energy are well-suited for this application. Post caesarean section patients may use blankets to warm their bodies effectively.

In managing hypothermia, blanket warmers are more effective because they generate heat that can be adjusted to specific temperatures. This allows hypothermic patients to receive heat, which is transferred to their bodies through conduction and convection. Blanket warmers are among the active warming devices used to manage postoperative hypothermia, helping prevent shivering beyond the safe threshold. These devices are essential in maintaining thermal stability during hypothermic episodes. The blanket warmer system typically delivers heat through a blower, which transfers warm air into the blanket, creating a consistent warming effect. Active warming techniques such as blanket warmers are viable interventions to restore body temperature in patients experiencing temperature drops due to regional anesthesia.

The study results showed a significant difference in the average body temperature of post caesarean section patients after the use of a blanket warmer, indicating its effectiveness in managing mild hypothermia. The blanket warmer operates by blowing heated air through a hose into a special warming blanket (convection), which increases body temperature due to exposure to warm air. The nursing implications of this study lie in guiding nurses to deliver proper care to postoperative hypothermic patients. Quality nursing care should be provided through a systematic nursing process, which is a problem-solving approach designed to ensure effective and structured patient care. A key component of this process includes offering appropriate interventions, one of which is the use of blanket warmers, in accordance with established standard.

This finding aligns with the previous study which reported that using a blanket warmer effectively increased body temperature in shivering patients (Işıklı & Fındık Ü, 2022). Other research concluded that blanket warmers are more effective in normalizing temperature in post–Cesarean hypothermic patients (Zhuo et al., 2022). Blanket warmers to be more effective for postoperative hypothermia management and more effective than regular cloth blankets in raising body temperature in mildly hypothermic post cesarean patients (Al-Dardery et al., 2023).

The use of blanket warmers is more effective in treating hypothermia because the temperature output can be precisely controlled. This allows for efficient heat transfer from the blanket to the patient's body (Muchtar, 2023). The use of an electric blanket increased the body temperature of four mildly hypothermic patients. Blanket warmers deliver warm air, typically through a hose, into a special patient blanket to provide radiant heat to the skin and increase internal body heat (Nieh & Su, 2016).

This study has several limitations. First, the pre-experimental one-group pretest–posttest design did not include a control group; therefore, the observed improvement in body temperature cannot be attributed solely to the blanket warmer intervention, as natural postoperative recovery or other clinical factors may also have contributed. Second, the study was conducted in a single hospital with a relatively small sample size, which may limit the generalizability of the findings. Future studies should include a control group receiving standard postoperative care or alternative warming methods and recruit larger samples using more rigorous study designs, such as randomized controlled trial.

CONCLUSION

The intervention was effective in significantly increasing body temperature after treatment. The effect size was large, the findings indicate that the intervention has the potential to improve thermoregulation. This technique can be administered by trained nursing staff under appropriate supervision.

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CONFLICTS OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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