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The Effectiveness of Hotpack Application on the Degree of Shivering in Post-Spinal Anesthesia Patients at Cilacap General Hospital

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Abstract

Shivering is a complication that often occurs in patients after spinal anesthesia which can affect recovery. This research aims to analyze the effectiveness of using hot compresses in reducing the degree of shivering in patients after spinal anesthesia at Cilacap Regional General Hospital. This research used a quantitative approach with 16 perioperative patients who experienced shivering after spinal anesthesia. Data collection was conducted in the Central Surgical Installation of the hospital, and Wilcoxon signed rank test was used for data analysis. The results showed a significant reduction in shivering, with the mean shivering rate decreasing from 3.06 to 0.31 after hot pack application (p-value = 0.000). These findings suggest that hot pack therapy is an effective non-pharmacological intervention for shivering after spinal anesthesia. This research has implications for the development of better postoperative care practices and highlights the potential of non-pharmacological methods in anesthesia recovery management. Further research is recommended to explore comparisons with other interventions.

Keywords: shivering, spinal anesthesia, hotpack, non-pharmacological therapy, postoperative care.

INTRODUCTION

According to (Rogobete and Sandesc, 2022), anesthesia consists of two main types: general anesthesia and regional anesthesia (spinal anesthesia). Spinal anesthesia is a technique used in surgical procedures, and more than 80% of operations are performed using spinal anesthesia techniques rather than general anesthesia (Romansyah et al., 2022). Spinal anesthesia is an alternative to general anesthesia for some surgical procedures. The benefits of spinal anesthesia include shorter patient recovery and reduced need for pain medication after surgery. Spinal anesthesia techniques are widely used because the drug effect is faster and the failure rate is lower (Imani, 2020). Spinal anesthesia is anesthesia performed by injecting anesthetic drugs into the subarachnoid. Spinal anesthesia is often performed on the lower extremities because it works quickly, sensory and motor blockade is deeper, the risk of anesthetic drug toxicity is minimal, and fetal contact with drugs is minimal (Widiyono et al., 2020). Spinal anesthesia techniques generally use a multimodal anesthetic approach to stabilize and comfort patients. This technique begins with the administration of a mixture of bupivacaine (1.8-2.5 mL 0.5%) with fentanyl (15-20 mcg) by injecting it into the lumbar function. Then, the patient lies on his back on the operating table, and the height of the spinal block is checked (Fish, 2020).

Until now in Indonesia there is no clear data on the incidence of shivering in patients undergoing spinal anesthesia after surgery. More than 80% of surgical procedures in Indonesia are performed under spinal anesthesia rather than general anesthesia. Based on statistical data and research, it is known that 60-70% of morbidity associated with surgery is caused by postoperative complications, one of which is shivering (Donsu et al., 2022).

According to (Def et al., 2022), post-anesthesia is a time with a high risk of anesthetic complications occurring in at least 2.5%. One of the common complications after spinal anesthesia is shivering, which is caused by the effects of spinal anesthetic drugs that cause sympathetic block and sensory block to peripheral temperature resistors, thus inhibiting temperature exchange (Esmat et al., 2021). Post-anesthesia is a high-risk complication time (Suswita, 2019). In patients with spinal anesthesia, it can cause vasodilation and hypothermia. To maintain body temperature, body heat transfer takes place from the core to the periphery. In spinal anesthesia, blockage of the sympathetic nervous system occurs at the level of the affected area so that vasodilation only occurs under occlusion of the affected area. This causes shivering and makes the patient uncomfortable (Hidayah et al., 2021). Shivering affects the condition of spontaneous, erratic, and unsynchronized skeletal muscle contractions in an effort to increase Basal Metabolic Rate (BMR) (Low et al., 2022). Patients who experience shivering will experience involuntary muscle movement (Tilahun et al., 2021). Shivering can cause harmful effects, including increased oxygen demand, increased body metabolism, increased CO2 production, greater risk of hypoxemia, the onset of lactic acidosis, increased intracranial and intraocular, increased postoperative pain, and catecholamine release. The main signs of shivering are tremors and normal thermoregulatory responses (Nugraheni et al., 2024). Due to increased oxygen demand and carbon dioxide production, the body responds with increased pulse rate, blood pressure, and cardiac output. This condition is dangerous for patients with cardiovascular and lung problems, such as arrhythmias, heart failure, myocardial infarction, and hypertension, especially in elderly patients (Muchtar & Masda, 2021).

Shivering is the body's response to hypothermia and can also be triggered by pain stimulation and certain anesthetic drugs. Overcoming thermoregulatory problems such as shivering can be achieved by maintaining normal body temperature during surgery (Nugraheni et al., 2024). In addition, shivering can stretch the surgical incision, which can exacerbate postoperative pain. Shivering can also be associated with increased adrenergic and sympathetic hyperactivity and organ dysfunction and can also cause patient discomfort and increase the likelihood of postoperative complications such as infection and bleeding (Lopez, 2018). Shivering has the potential to have adverse effects on patients, including increased oxygen levels, acute postoperative pain, and inhibiting the observation process in patients (Mukarromah et al., 2022). According to (Ummah, 2019), Shivering events need to be prevented to reduce losses to patients and doctors. One way to prevent and handle it is by organizing the operating room and recovery room to meet the needs. The occurrence of post-spinal anesthesia shivering can be prevented and overcome with pharmacology and non-pharmacology. Non-pharmacological approaches to prevent hypothermia and shivering are commonly referred to as rewarming techniques. Rewarming techniques can be carried out, among others, by the use of warm blankets,

oxygen humidification, the installation of warm intravenous fluids, and the provision of hotpack therapy (Hidayah et al., 2021).

In a research conducted at Dr. Sitanala Tanggerang Hospital, a research was conducted to overcome shivering in the recovery room by giving warm blankets. Passive therapy using a warm blanket with cotton material shows an insignificant increase in body temperature that causes postoperative shivering with a higher degree of shivering (Fitriani et al., 2021). Based on the description above, the researcher is interested in making updates to overcome the incidence of shivering, namely by using a hot pack. The hot pack used in this research is a disposable packaged hot pack with a temperature of 40℃. The hot pack to be used is 9.5 cm x 5 cm in size. The contents in this hot pack are water, activated carbon, inorganic salt, iron powder, and vermiculite. The benefits of using this hot pack are that it keeps the body warm, increases vascular circulation, provides a warm sensation quickly, and lasts up to 15 hours (Mukarromah et al., 2022). Hotpack therapy is one of the heat therapies that will restore body temperature quickly. The sensation and effect of heat delivered by the dermal nerves cause dilatation of the dermal capillaries to widen and make more blood flow to the skin surface. Sufficient blood flow causes the temperature near the skin surface to increase (Lopez, 2018). Hot packs can be used as a substitute for the bulb that must be replaced when the temperature changes. Filling hot water in the buli-buli can spill and wet the patient if it drips (Susantia 2016 in Sari et al., 2022).

Hot packs will be applied to the right and left palms for about 15 minutes (Mukarromah et al., 2022). The heat from the hot pack can cause maximum vasodilation within 15-20 minutes; applying a compress for more than 30-45 minutes will result in tissue congestion, and the patient will be at risk of burns because the contributing blood vessels are unable to dissipate heat adequately through the blood circulation (Foottit, 2021). Physiologically, the body's response to heat can cause dilation of blood vessels, dilute the blood, relax muscles, increase tissue metabolism, and increase capillary permeability. This response from heat can be used to treat many conditions and diseases that exist in the body. In addition, the body can respond effectively to low-temperature adjustments (Ratnasari et al., 2021). Average skin temperature contributes 20% to shivering control. So, the use of hot packs can improve shivering. Some areas of the body, such as the hands and face, have a higher concentration of skin temperature sensors, so the installation of hot packs in these areas has a greater effect in suppressing shivering (Jain et al., 2018).

Based on the results of a preliminary research conducted at Cilacap Regional Hospital, it was found that from the monthly report in the central surgical installation (IBS) since the last 6 months starting from May to October 2024, the number of patients undergoing surgery with spinal anesthesia was 1,436 patients. To overcome shivering after spinal anesthesia at regional general hospital Cilacap, in addition to pharmacological therapy, non-pharmacological therapy is also given by giving warm blankets. However, this action still encountered patients who experienced shivering.

Based on the above background, the purpose of this research is to determine and analyze the effectiveness of hot pack administration on the degree of shivering in patients after spinal anesthesia at Cilacap Hospital. This research is expected to help anesthesiologists handle shivering patients at Cilacap Hospital. In addition, this research

is expected to obtain the latest research results related to the effectiveness of giving rise to the degree of shivering after spinal anesthesia.

METHOD

This research uses a quantitative approach with the population consisting of patients who experienced perioperative shivering after receiving spinal anesthesia at regional general hospital Cilacap. The sample includes patients who experienced shivering after spinal anesthesia, and the sample size was determined using the Federer Formula. The research employs a simple sampling method, focusing on one experimental group. The intervention group consists of 16 perioperative patients with spinal anesthesia who experienced shivering and were given a hot pack.

Data collection was carried out following the proper licensing process, with permission obtained through a cover letter from the Faculty of Health Sciences, Muhammadiyah Purwokerto University. A preliminary research was conducted after receiving approval. Data collection took place in the Central Surgical Installation (IBS) room at Cilacap Hospital, where patients who experienced shivering were observed, the degree of shivering was evaluated, and hot packs were administered as an intervention. The data analysis process involved coding, editing, data entry, and cleaning, with both univariate and bivariate analysis techniques applied.

RESULT AND DISCUSSION

Univariate Analysis Results

Based on the results of research conducted at regional general hospital Cilacap on 16 respondents. The results of the research are shown in the table:

Table 1. Frequency Distribution of Respondents' Characteristics (n=16)

Characteristics	F	Percentage (%)
Gender		
Male	3	18,8
Female	13	81,2
Age		
Adults 19-44 years old	12	75,0
Pre-elderly 45-59 years	3	18,8
Elderly > 60 years	1	6,2
Operation Type		
Orthopedics	5	31,2
Laparotomy	3	18,8
Sectio Caesarea (SC)	8	50,0
Length of Operation		
Fast < 1 hour	1	6,3
Medium 1-2 hours	13	81,2
Long > 2 hours	2	12,5

Based on table 1, based on the characteristics of the respondents above, shows that the largest frequency of respondents is female, 13 people (81.3%). Based on the respondents, most of them are between 19-44 years old, and as many as 12 people (75%). Meanwhile, most of the types of surgery that experience shivering are Sectio Caesarea

(SC) and as many as 8 people (50.0%). Then, the characteristics based on the length of surgery were mostly 1-2 hours, as many as 13 people (82.3%).

Table 2. Frequency Distribution of Shivering Degree Respondents Before Hotpack

No.	Degree of (Before hot pack)	Frequency (n)	Percentage (%)
1.	Degree 0	0	0
2.	1st degree	2	12,5
3.	2nd degree	1	6,2
4.	3rd degree	7	43,8
5.	4th degree	6	37,5
	Total	16	100,0

Source: Results of Primary Data Processing SPSS

Based on table 2, describes the degree of shivering in patients after spinal anesthesia before being given a hot pack, the majority in degrees 3-degree 4. Degree 3 has as many as 7 people (43.8%), and degree 4 has as many as 6 people (37.5%).

Table 3. Frequency Distribution of Respondents' Degree Shivering after being given a hot pack

No.	Degree of Shivering (After being given a hot pack)	Frequency (n)	Percentage (%)
1.	Degree 0	13	81,3
2.	1st degree	1	6,2
3.	2nd degree	2	12,5
4.	3rd degree	0	0
5.	4th degree	0	0
	Total	16	100,0

Source: Results of Primary Data Processing SPSS

Based on table 3 describes the degree of shivering in patients after spinal anesthesia after being given a hot pack; the results showed that most of them did not shiver (Degree 0) as many as 13 people (81.3%).

Bivariate Analysis

Before the bivariate test is carried out, a normality test is first carried out using the Shapiro-Wilk test because the number of samples is 16. the basis for decision-making is if the significant value> 0.05, then the research can be said to be normally distributed; if the significant value <0.05, then the data is not normally distributed.

Table 4. Shapiro-Wilk test results Effectiveness of Hotpack Administration On the Degree of Shivering in Patients After Spinal Anesthesia

	Statistics	N	Sig.
Degree of shivering before hot pack application	0,769	16	0,002
Degree of shivering after hot pack application	0,496	16	0,000

Based on the decision-making of the Shapiro-Will test, the normality value of the data before giving hot pack 0.002 and after giving hot pack 0.000 <0.05, which means not normally distributed, the bivariate analysis uses non-parametric or Wilcoxon test.

Based on the results of data analysis using the SPSS application with the Wilcoxon test, the effectiveness of hot pack administration on the degree of shivering can be seen in the following table:

Table 5. Results of Wilcoxon Test Analysis of the Effectiveness of Hotpack Giving on the Degree of Shivering in Patients After Spinal Anesthesia

	Frequency (n)	Mean	P value
Degree of shivering before hot pack application	16	3,06	0,000
Degree of shivering after hot pack application	16	0,31	
P = 0.000 < α = 0.05 Wilcoxon Signed Rank Test			

Based on Table 5, it can be seen that the average degree of shivering in patients before being given a hot pack is 3.06, and after being given a hot pack, it decreases to 0.31. After conducting statistical tests using the Wilcoxon test to determine the effectiveness of hotpack administration on the degree of shivering, the results obtained asymp sig = 0.000 < α = 0.05.

Characteristics of Respondents Who Experienced Shivering

In this research, many respondents who experienced shivering were female, with a percentage of 81.3%. These results are obtained because the level of tolerance to thermoregulation is lower than that of men. Women have greater body temperature fluctuations than men; this occurs due to the influence of hormonal production, namely the hormone progesterone. The distribution of fat in the bodies of men and women is different, so it can affect the distribution of heat in the body. Therefore, women are prone to shivering and cold injuries (Potter & Perry, 2008).

The age of most shivering after spinal anesthesia in this research was 19-44 years old, with a percentage of 75.0%. These results were obtained because the thermoregulatory response in adulthood is better than in pre-elderly and elderly, so post-spinal anesthesia shivering is more common in the adult age group. This is because the thermoregulatory response to heat and cold in the elderly begins to decline (De Witte & Sessler, 2002)

The type of surgery that experienced the most post-spinal anesthesia shivering in this research was Sectio Caesarea (SC), with a percentage of 50.0%. The number of respondents who experienced post-anesthesia shivering was Sectio Caesarea (SC) because they underwent surgery by opening a large enough body tissue. This is in line with research (Eberhart et al., 2015), which states that surgery that opens up large enough tissues so that parts of the body are exposed to cold operating room temperatures is greater and causes an increase in the incidence of shivering.

In this research, the duration of surgery was 1-2 hours, and the patient experienced the most incidence of shivering, with a percentage of 81.3%. Researchers argue that the long duration of surgery can increase the risk of shivering after spinal anesthesia. This is because the skin exposure to cold temperatures lasts a long time. In addition, spinal anesthesia inhibits the release of catecholamine hormones, which play a role in generating heat through body metabolism. Research (Poveda et al., 2009) also explains the relationship between the length of surgery and the incidence of shivering. It is known that the longer the operation, the lower the body temperature so that it can trigger shivering.

Effectiveness of Hot Packs on Reducing the Degree of Shivering

The results of the Wilcoxon Test statistical test obtained a significance value of p-value = 0.000 with a significance level of α = 0.05, meaning that the p-value < α, thus it can be concluded that H0 is rejected H1 is accepted, which means that there is effectiveness of giving hot packs to the degree of shivering in patients after spinal anesthesia at Cilacap Hospital.

In accordance with the research that has been conducted by (Purnomo et al., 2024), heat therapy using a hot pack is effective in reducing the degree of shivering and can increase comfort in overall patient recovery. (Sari et al., 2022) suggested that giving a hot pack can cause an increase in body temperature back to normal. This is due to the heat effect of a hot pack, which reacts to skin receptors that function as hot and cold body temperature regulation. In research, (Mukarromah et al., 2022) concluded that giving a hot pack causes a reaction to skin receptors and channels the effect of hypothalamic temperature through evaporation to reduce the degree of shivering. This is related to the theory of (Guyton and Hall, 2016) that there are three main ways that increase body heat. When the body is too cold, the temperature regulation system takes the opposite step to maintain body temperature, including vasocontraction of the skin, piloerection, and increased thermogenesis. The stimulus that triggers shivering comes from the hypothalamus, specifically the dorsomedial area of the posterior hypothalamus, which is located with the third ventricular wall. This area is known as the main motor center for shivering. This process contributes to heat loss through evaporation and heat generation due to muscle activity.

According to (Budiono, 2015), General and regional anesthesia techniques can interfere with the body's thermoregulatory function. This disorder causes a decrease in basal metabolism, a decrease in heat production, and an increase in heat loss, which can result in hypothermia. Heat loss occurs through conduction, convection, and evaporation mechanisms, which are influenced by the operating room environment, surgical procedures, and anesthesia techniques. The body normally maintains temperature in cold environments through sympathetic nerve-mediated vasoconstriction. However, in patients undergoing anesthesia, sympathetic nerve blockade causes vasodilation, which accelerates the decrease in body temperature. As a result, body heat undergoes redistribution, moving from central to peripheral parts to maintain body temperature balance.

One of the measures to prevent shivering after spinal anesthesia is by giving hot packs because hot packs have a vasodilating effect on blood vessels and increase circulation; the increase in blood flow will increase the metabolic process of residual anesthetic drugs so that it can restore sensory and motor impulses in the extremities (Anggraini et al., 2022).

In this research, the hot pack was given to both palms covered by gloves that had been designed by the researcher. Giving a hotpack on both palms is in accordance with the concept of the theory of the body's internal temperature defense process, which says that the thermal information process occurs in three phases, namely: afferent input, central regulation, and efferent response (Upadhya R et al., 2018). The mechanism of maintaining internal temperature has 3 mechanisms, namely: afferent sensing, central control, and efferent receptors. There are heat and cold receptors throughout the human body.

Peripheral and central thermoreceptors sense increases and decreases in body temperature and send this information to the hypothalamus. The body then responds with various mechanisms to generate heat based on the body's needs (Nasyafa et al., 2024).

This non-pharmacological technique of hotpack administration involves the use of heat energy through conduction and evaporation methods. The conduction method is applied with warm gloves. This causes direct heat transfer from the object to the skin through direct contact. When the skin comes into contact with a warm object, heat transfer occurs, followed by the evaporation process, where heat energy turns into a gaseous form (Irmachatshalihah & Alfiyanti, 2020).

Based on the results of research at Cilacap Hospital, it was found that the degree of shivering before being given a hotpack obtained results with shivering degree 1 as many as 2 respondents, shivering degree 2 as many as 1 respondents, shivering degree 3 as many as 7 respondents and shivering degree 4 as many as 6 respondents. Based on research on the degree of shivering after being given a hot pack, the results obtained with a degree of shivering of 0 in as many as 13 respondents, a degree of shivering of 1 in as many as 1 respondents, and a degree of shivering of 2 in as many as 2 respondents.

The results of this research indicate that most experienced a decrease in the degree of shivering after hot pack administration. Physiologically, the body's response to heat is to cause the dilation of blood vessels, reduce muscle tension, increase tissue metabolism, and increase capillary permeability (Sari et al., 2022). This response to heat is utilized in therapy to treat various conditions in the body. In addition, the body also has the ability to adapt well to low-temperature changes. According to research, heat therapy using a hot pack can restore body temperature quickly; the sensation and effect of heat transmitted through the skin and received by derma nerves result in dilated dermal capillaries, and the body gets adequate flow and causes the temperature to around the skin surface to increase (Sari et al., 2022).

The results of the Wilcoxon test stated that the p-value = 0.000 from 0.05 (0.000 < 0.05); with this, the researcher has high confidence that the intervention provided is effective in reducing the degree of shivering. This shows that this intervention can be an effective option in managing shivering conditions in post-spinal anesthesia patients. Interventions that are effective in reducing the degree of shivering can improve overall patient comfort and recovery.

CONCLUSION

The conclusion of this research indicates that most post-spinal anesthesia patients experiencing shivering at Cilacap Regional Hospital are female (81.3%), aged 19-44 years (75%), undergoing Sectio Caesarea surgery (50.0%), and have a surgery duration of 1-2 hours (82.3%). Before receiving the hot pack, the majority had a shivering degree of 3 (43.8%), which decreased significantly to degree 0 (81.3%) after the intervention. The average degree of shivering decreased from 3.06 before the intervention to 0.31 after hotpack administration. The Wilcoxon test showed a p-value of 0.000 < α = 0.05, confirming the effectiveness of hot packs in reducing shivering. It is recommended that Cilacap Regional General Hospital consider using hot packs as a non-pharmacological

method for postoperative care, educate patients on the benefits and prevention of shivering, and conduct further research comparing hot packs with other methods. Muhammadiyah Purwokerto University is encouraged to integrate the findings into teaching materials and enhance collaboration with hospitals for non-pharmacological shivering management implementation.

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