



THE EFFECT OF GIVING A HEATING LAMP ON INCREASING THE BODY TEMPERATURE OF PATIENTS WITH POSTOPERATIVE SHIVERING

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ABSTRACT

Shivering is closely related to hypothermia and is one of the seriously problems in surgical patients that can hurt the patient's condition because it affects patient comfort and increases metabolic needs that cause cardiovascular complications. The causes of shivering are the temperature of the operating room, the extent of the surgical wound, age, body mass index, fluids, gender, type of anesthesia, and duration of surgery. The aim of this study was to determine the effect of giving a heating lamp on increasing the body temperature of patients with postoperative shivering. This study was a quantitative study with a pre-experimental design type one group pretest-posttest. The population in the survey was postoperative patients. The sample in this study amounted to 32 respondents using the accidental sampling technique. The instruments in this study were thermometers, heating lamps, and observation sheets. Data analysis used the Wilcoxon sign rank test with $P < 0.05$. This study showed that the average body temperature of patients before being given a heating lamp was 35.10 C. After being given a heating lamp, the average patient temperature was 36.70C. The results of the statistical analysis test obtained a P value of 0.00, which means that there is an effect of providing a heating lamp on increasing the body temperature of patients with postoperative shivering. Postoperative shivering can be treated by minimizing heat loss during surgery with various mechanical interventions such as providing a heating lamp.

Keywords: body temperature; heating lamp; hipotermia

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INTRODUCTION

Postoperative shivering is shivering that can cause side effects including patients feeling uncomfortable or even painful due to stretching of the surgical scar, increasing oxygen requirements, increasing metabolic rate, increasing carbon dioxide production, increasing arterial hypoxemia, lactic acidosis, and heart rhythm disturbances. Postoperative shivering is the body's compensation mechanism for hypothermia (Fauzan et al., 2024). A survey of six Asia-Pacific countries showed that compliance with international perioperative temperature management guidelines in Asia-Pacific is still poor, especially in small hospitals (Koh et al., 2021). The study results at Karawang Regional Hospital showed 19 cases of shivering from a sample of 65 people, with the majority of 11 patients being female, and the majority of patients experiencing grade II shivering (Fauzi et al., 2015). The most common surgical procedure that shows shivering is caesarean section. Research results at the Surakarta Dental and Oral Hospital found that the majority of patients with multiple ond orchietomy surgery experienced a decrease in body temperature post-surgery, most of which (68.8%) occurred in women (Kartini et al., n.d.). From the study results above, it can be said that the incidence of shivering in the Jombang Regional Hospital Center from June to August 2022 was 926 patients with surgery, while those who showed post-operative shivering were 237 patients.

Body temperature is the difference between the amount of heat produced by body processes and the amount of heat that leaves the body (Potter, 2017). Post-operative patients always

experience changes in temperature, including hyperthermia and hypothermia. The occurrence of postoperative shivering is due to the condition of Hypothermia experienced by the patient, which is caused by several factors. Perioperative management in risk identification can be improved to minimize complications and optimize preventive measures. Shivering can occur due to the influence of anesthetic drugs, post-surgical pain, operative hypothermia, hypoxia, the presence of pyrogens, early recovery from the effects of spinal anesthesia, and sympathetic overactivity (Saputra et al., 2024). According to research by (Cho et al., 2022) risk factors for post-operative hypothermia are body mass index ≤ 22.9 kg/m², initial heart rate ≤ 73 beats/minute, initial body temperature $\leq 36.8^{\circ}\text{C}$, intraoperative use of nicardipine, and number of medications. those given intravenous fluids greater than 800 mL. Postoperative shivering can also be treated by minimizing heat loss during surgery with various mechanical interventions such as infusion fluid heaters, increased environmental temperatures, heating lamps, passive external rewarming blankets and the use of drugs. The heating lamp will transfer heat by conduction to the skin, captured by afferent nerves and received by the hypothalamus, perceived as a state of normothermia so that the body will stop the heat by stopping shivering.

The results of previous research conducted by (Haryanto, 2022) stated that thermal blankets can help patients reduce post-operative shivering. This is what makes researchers also interested in proving whether the use of other methods, namely the provision of heating lamps, is also effective in increasing body temperature in patients with post-operative shivering. The aim of this study was to determine the effect of providing heating lamps on increasing body temperature in patients with post-operative shivering.

METHOD

This study was a quantitative study with a pre-experimental design type one group pretest-posttest. The population in the survey was postoperative patients. The sample in this study amounted to 32 respondents using the accidental sampling technique. The instruments in this study were thermometers, heating lamps, and observation sheets. Data analysis used the Wilcoxon sign rank test with $P < 0.05$.

The criteria used as samples must meet the predetermined inclusion criteria, including:

- a) Patients who are willing to become respondents.
- b) Post-operative patients who experience shivering.

The exclusion criteria are:

- a) Patients who experience redness of the skin before therapy ends.
- b) Patients who are uncooperative while being given warm light therapy.

The independent variable in this study is the provision of a heating lamp. The dependent variable in this study is the patient's body temperature.

The steps in providing a heating lamp intervention are that the researcher observes the respondents to measure the body temperature of shivering patients for 5 minutes, then a standing heating lamp is given and shone directly on the jugular vein for 50 minutes at a distance of approximately 50 cm, then the body temperature is measured again for 5 minutes. This study has passed the ethical test at the Ethics Committee of the Jombang Regency General Hospital with No: 28 / KEPK / III / 2023.

RESULT

Based on table 1, data on respondent characteristics based on gender were obtained, most of the respondents were female, 19 respondents (59.4%). Based on age, most of the respondents were in the age range >41 years, 18 respondents (56.2%). Based on the type of surgery, all respondents underwent major surgery, 32 respondents (100%). Based on the duration of the surgery, most of the respondents were more than 1 hour, 26 respondents (81.2%). Based on the type of anesthesia, most of the respondents had regional anesthesia, 20 respondents (62.5%). Based on body mass index, most were in the normal category, 25 respondents (78.1%). Based on table 2 regarding the results of the statistical analysis calculation, the minimum and maximum values before being given a heating lamp, the respondents' body temperature was in the range of 33.8 - 36.2 with a mean value of 35.10 C. The respondents' body temperature after being given a heating lamp became 35 - 36.8 with a mean value of 36.70C. The results of the statistical analysis of the Wilcoxon Sign Rank Test obtained a P value of 0.00, P <0.05, which means that there is an effect of providing a heating lamp on increasing the body temperature of patients with post-operative shivering.

Table 1.
Respondent characteristics (n= 32)

Characteristics	f	%
Gender		
Woman	19	59.4
Man	13	40.6
Age		
< 20 Years	8	25
20 – 40 Years	6	18.8
> 40 Years	18	56.2
Operation Type		
Big Operation	32	100
Operation Time		
Less than 1 hour	6	18.8
More than 1 hour	26	81.2
Types of Anesthesia		
Regional Anesthesia	12	37.5
General Anesthesia	20	62.5
Body mass index		
Normal Body Weight	25	78.1
Overweight	4	12.5
Underweight	3	9.4

Table 2.
Result of analysis

Variable	Pre Test	Post Test
Min-Max	33.8 – 36.2	35 – 36.8
Mean	35.1	36.7
P Value	0.00	

DISCUSSION

Body temperature of shivering patients before being given a heating lamp The results of the study showed that the body temperature of respondents before being given a heating lamp, most of whom experienced shivering, were female, namely 4 respondents (12.5%) with a body temperature of 35.2 °c. In the male gender, there were also 4 respondents (12.5%) but had a higher body temperature than the body temperature of the female gender, namely 35.8 °c. Gender is the biological difference between women and men since a person is born. Sex is related to the male and female bodies, where men produce sperm, while women produce egg cells and are biologically capable of menstruating, getting pregnant and breastfeeding (Saputra et al., 2024). Physically, men are stronger than women, this is also

because men have more muscles than women, this is what causes men to have stronger endurance.

The results of the study of body temperature of patients experiencing shivering based on age were mostly > 40 years old, 5 respondents (15.6%) with a body temperature of 35.2c. While at the age of 20-40 years, most had a body temperature of 35.8c, 4 respondents (12.5%). Elderly patients are included in the extreme age group, they are at high risk for hypothermia in the perioperative period (Putranto & Kanita, 2022). There is a relationship between age and the incidence of shivering in postoperative patients (Iskandar et al., 2023). The incidence of hypothermia within 2 hours was 56.6%, and after 2 hours, it was 100%. Mean age was 49.36 ± 16.10, and 17.8% were over 65 years old. The mean body mass index (BMI) was 27.96 ± 3.94 kg/m²; 60.8% of the patients had American Society of Anesthesiologists (ASA) I score, 33.4% had ASA II and 5.8% had ASA III; 35.8% of the patients had co-morbidities. Intravenous and irrigation fluids were unwarmed; 99.9% of the patients were warmed passively, and only 0.1% of patients received active heating intraoperatively (Sari et al., 2021). The incidence of hypothermia is higher in elderly patients (>65 years), and patients with comorbidities. Postoperative hypothermia is also associated with Body Mass Index. In line with research (Nurmansah et al., 2021), the greater the body mass index, the higher the body temperature, the longer the operation and the higher the dose of inhalation anesthesia, the lower the body temperature. The closest correlation is body mass index. respondents who have a high BMI because they have a large share of fat (Thaher et al., 2024).

Fat is one of the body's heat-producing cells, helping to keep the body temperature constant even when the temperature outside drops. With a low BMI, heat loss is easier and is a risk factor for hypothermia. The thinner the fat, the easier hypothermia occurs. The limited availability of fat-based energy sources has an impact on this. Body fat reserves serve as an excellent source of energy. Because they have adequate heat protection mechanisms and heat-producing energy sources, especially fat density, a high body mass index is better at maintaining body temperature than a low body mass index (Guyton & Hall, 2016). There is a relationship between the length of surgery and the incidence of shivering, in line with research by (Rahmanto et al., 2024) there is a relationship between the length of operation and hypothermia in post-spinal anesthesia patients. The operation takes a long time, requires a large incision, and often requires fluids to clean the abdominal cavity which results in heat being lost due to the moist surface of the body. The long duration of the operation automatically results in the anesthesia taking a long time. This will increase the body's exposure time to cold temperatures and cause the accumulation of drugs and anesthetic agents in the body. In addition, the cold operating room temperature makes it easier for patients to lose body heat (Aziz et al., 2024).

General anesthesia performed on elderly patients can cause a shift in the thermoregulatory threshold to a greater degree compared to younger patients. A higher risk level occurs in elderly patients to experience postoperative shivering, in the elderly there has been a failure to maintain body temperature, either with or without anesthesia, this is likely due to a decrease in thermoregulatory vasoconstriction associated with age. This research is in line with research conducted by (Triyanto et al., 2022) there is a relationship between the type of anesthesia and the incidence of hypothermia in the Recovery Room. An odds ratio (OR) value of 7.410 means that patients with general anesthesia have a 7.410 times greater chance of experiencing hypothermia than patients with regional anesthesia. Body temperature based on the type of surgery, all patients who experienced shivering occurred in patients with a history of severe surgery, a total of 5 respondents (15.6%) with a body temperature of 35.8c. The type of major surgery that opens the body cavity, for example in thoracic or abdominal surgery,

will greatly affect the incidence of hypothermia. Abdominal surgery is known as a cause of hypothermia because it is associated with long-term surgery, large incisions and often requires fluids to clean the peritoneal space (Mashitoh et al., 2018)

The type of heavy surgery affects the incidence of shivering due to the length of the procedure in the operating room, so the lighter the procedure, the less likely shivering is to occur. Based on the results of the study, patients who experienced shivering were more likely to experience it, namely patients whose surgery lasted more than 1 hour, namely 5 respondents (15.6%) with a body temperature of 35.2°C. The length of surgery and anesthesia have the potential to have a major influence, especially anesthetic drugs with higher concentrations in the blood and tissue (especially fat), solubility, and longer duration of anesthesia, so these agents must try to achieve balance with the tissue (Mashitoh et al., 2018). Long duration of surgery, automatically the anesthesia will also last longer, so that it will increase the accumulation effect of drugs and anesthetic agents in the body more and more. Surgery with a long duration will increase body temperature exposed to cold air. A long duration of repair can result in a decrease in metabolism so that at the same time the body will reduce heat production. This can increase the incidence of hypothermia in patients (Suanda, 2014). In line with research by (Fitriani et al., 2023) The long duration of surgery spontaneously causes the anesthesia to take longer. This will cause the effect of the accumulation of drugs and anesthetic agents in the body to increase as a result of the length of time the drug or anesthetic agent is used in the body.

The results of the study said that body temperature that experienced shivering based on the type of anesthesia was more often experienced by patients with regional anesthesia, namely 4 respondents (12.5%) with a body temperature of 35.2°C. At the end of anesthesia with thiopental, halothane, or enflurane sometimes causes hypothermia to shivering. The cause of hypothermia is most likely iatrogenic due to the temperature of the operating room (OR), surgical exposure, infusion and irrigation of unwarmed fluids, anesthesia, and other factors (Xu et al., 2023). General and neuraxial anesthesia greatly disrupt normal thermoregulatory control, resulting in hypothermia, especially in unwarmed surgical patients (Rauch et al., 2021). The use of the type of anesthesia affects the incidence of shivering, not determined by the extent of anesthesia given. Choosing the right drugs will help reduce the potential for shivering in postoperative patients. General anesthesia can cause disturbances in the body's thermoregulation, where general anesthesia results in an increase in the response threshold value to heat and a decrease in the response threshold value to cold. Under normal circumstances, the human body is able to regulate temperature in hot and cold environments through the temperature protection reflex regulated by the hypothalamus.

Based on the results of the study, the body temperature of shivering patients who had normal body weight was 4 respondents (12.5%) with a body temperature of 35.2°C. Hypothermia is a condition where the body's core temperature is below 35°C (Guyton & Hall, 2016). A person's metabolism is different, one of which is influenced by body size, namely height and weight which are assessed based on body mass index which is a factor that can affect metabolism and have an impact on the thermoregulation system (Saputra et al., 2024). When humans are in an environment that is colder than their body temperature, they will continue to produce heat internally to maintain their body temperature, a larger body stores a lot of fat tissue, so it is better at maintaining body temperature. Treatment of surgical patients becomes complex due to the physiological changes that occur, including bleeding complications, irregular heart rhythms, problems with breathing, circulation, temperature control (hypothermia), as well as other vital functions such as neurological function, skin integrity and wound conditions,

genitourinary function, gastrointestinal, fluid and electrolyte balance and comfort (Potter, 2017).

Based on the results of the study, it was shown that all patients who experienced shivering after being given a heating lamp experienced an increase in body temperature. The results of the Wilcoxon test above show that the administration of a heating lamp has an effect on increasing body temperature with a sig value. (2-tailed) is 0.000 (<0.05) indicating that there is a significant difference between before and after being given a heating lamp on the increase in body temperature of postoperative shivering patients. This is in line with the theory that a heating lamp will transfer heat by conduction to the skin, captured by the afferent nerves and received by the hypothalamus, perceived as a state of normothermia so that the body will stop the heat by stopping shivering (Assimamaw et al., 2024). Heat lamps warm the surface of the skin, as the thermoregulatory system is more sensitive to the input of increased skin temperature. A heating lamp is an electric lamp that functions to provide heat radiation to the skin, resulting in an increase in body temperature. Warming temperatures are intended to prevent hypothermia and reduce afferent input, namely by warming skin receptors, especially in areas with the greatest receptor density such as the neck, chest and hands (Suindrayasa, 2017).

Administering a heating lamp is one of the efforts to increase the body temperature of patients with post-operative shivering, to obtain maximum results, a combination of other efforts can be carried out which can help accelerate the increase in body temperature. Non-pharmacological interventions to prevent hypothermia in post-operative patients These include forced-air warmers, warm intravenous fluids (intravenous fluids warm), electric blanket, and hot pack. In conclusion, several interventions such as administering warm intravenous fluids, using forced-air warmers, electric blankets, and Hot packs can be useful for preventing hypothermia in post-operative patients central surgical installation room (Yulianita et al., 2023). The nurse's role is to effectively warm the patient to maintain a normal condition body temperature after surgery not only to improve thermal comfort, but also to prevent maintenance and possible various post-operative complications with warming care protocol (Kameda & Okada, 2023).

CONCLUSION

Before giving the heating lamp, the average body temperature of respondents who experienced shivering was 35.1c (21.9%). After administering a heating lamp, the average body temperature of respondents who experienced shivering was 36.7 c (15.6%). The results of statistical tests using the Wilcoxon test method showed a 2-tailed sign value of 0.000, which means $\alpha \leq 0.05$. There is an effect of giving a heating lamp on increasing the body temperature of post-operative shivering patients

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