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A CROSS-SECTIONAL STUDY

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Abstract

Background: Abdominal surgery is a type of major surgical operation performed in the abdominal area with incision in the wall layer. The surgery has a risk, one of which is the incidence of shivering, and the long surgery period causes a continuous process of losing body heat.

Objective: to know the relationship between the length of surgery and the incidence of shivering in postoperative abdominal surgery patients in the central surgical installation of RSUD Hj. Anna Lasmanah Banjarnegera.
Methods: This research design uses cross-sectional. The sampling technique with total sampling obtained 50 with abdominal surgery. Instruments include age, gender, BMI, type of anesthesia, length of surgery, and incidence of shivering.
Findings: age with most of the early adult category 26-35 years at 14 (28.0%) for most of the female gender at 35 (70%) and the highest BMI with normal at 31 (62%). The length of operation of postoperative abdominal surgery patients with the majority in the fast category was less than 1 hour at 29 (58%).
Conclusion: there is a relationship between the length of surgery and the incidence of shivering in abdominal surgery patients in the Central Surgical Installation of Hj. Anna Lasmanah Banjarnegera Hospital with a p_value of 0.004 (<0.05) with a relationship in the moderate category with rho 0.416 with a relationship in the moderate.

Keywords: abdominal surgery, shivering, length of surgery

Introduction

Anesthesia has three stages: pre-anesthesia, intra-anesthesia, and post-anesthesia. The post-anesthesia recovery period is known as a time of high risk for complications and one of the most common complications after anesthesia is shivering (1).

Every anesthetic technique used has side effects that must be considered. One of the side effects often found in anesthesia techniques, both general and regional anesthesia is shivering. Post Anaesthetic Shivering (PAS) is a fasciculation of skeletal muscles that lasts more than 15 seconds due to perioperative hypothermia in patients. Shivering can cause discomfort in patients and can also cause an increase in body metabolism, oxygen consumption increases up to 200%–500% with a linear increase in carbon dioxide production (2).

Long periods of surgery and anesthesia potentially have a major influence that causes a continuous process of body heat loss. One of the complications that arise after anesthesia is hypothermia (3). Shivering can cause an increase in greater metabolism and increased pain in the surgical wound area accompanied by increased CO2, arterial hypoxemia, lactic acidosis, and increased heart rhythm (4). Abdominal surgery is one of the causes of shivering that can be caused by the long actions performed in
Wiryana's research (2017) obtained 53% of patients with a long operation of more than 1 hour experienced post-general anesthesia shivering in the recovery room. Whereas in Masithoh's research (2018) patients who underwent surgery for less than 1 hour with shivering were 9 patients (22.5%) and patients who had surgery for more than 1 hour with shivering were 12 people (30%). Obtained a p_value of 0.007 and it can be concluded that there is a relationship between the length of surgery and the incidence of shivering in post-spinal anesthesia patients (6).

Putri's research (2020) on the relationship between the length of surgery and the type of surgery with the incidence of post-anesthetic shivering (pas) in patients after spinal anesthesia. The results of the study obtained the incidence of shivering 41.7%, with a length of operation ≥90 minutes as many as 27 people (56.2%), and the type of non-laparotomy surgery as many as 33 people (68.8%). The results of the analysis showed that there is a relationship between the length of surgery and the type of surgery with the incidence of shivering (p_value <0.05) (7).

The results of a preliminary study conducted at the Hj. Anna Lasmanah Banjarnegara Regional General Hospital obtained data on the number of operations in three months, namely June to August 2023 as many as 75 patients with abdominal surgery so that the data obtained on the average number of operations per month with abdominal surgery is 25 patients per month. Interviews that have been carried out by researchers in the second week of September 2023 on patients undergoing abdominal surgery at the Central Surgical Installation of Hj. Anna Lasmanah Banjarnegara Hospital, obtained data that of the 10 patients there were 6 (60%) who underwent surgery with abdominal surgery experiencing shivering the appearance of shivering in surgery for more than 1 hour, some cases of shivering occur spasm, especially with general anesthesia. There are anticipations in handling shivering events carried out at the RSUD during this time, non-pharmacological measures are carried out by adjusting the temperature of the operating room and recovery room to be comfortable and warm, using a closed system or low-flow system in high-risk patients or critical patients, using warmed fluids, avoiding stagnant water on the operating table, using blankets. Pharmacological efforts are often carried out by administering several drugs known to be effective in overcoming shivering.

Based on the description above, researchers are very interested in researching the relationship between the length of surgery with the incidence of shivering in postoperative abdominal surgery patients in the central surgical installation of Hj. Anna Lasmanah Hospital Banjarnegara.

Methods
This study applied an analytical correlation design on a cross-sectional approach.

The population in the study were all post-abdominal surgery patients totaling 50 Determination of the sample with a total sampling of 50 patients. The study received Ethical Clearance with a number. B.LPPM-UHB/27/01/2024

Results
Table 1. Frequency distribution of post-abdominal surgery patients

<table>
<thead>
<tr>
<th>Variable</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Late adolescence (17-25 years)</td>
<td>6</td>
<td>12.0</td>
</tr>
<tr>
<td>Early adulthood (26-35 years)</td>
<td>14</td>
<td>28.0</td>
</tr>
<tr>
<td>Late adults (36-45 years)</td>
<td>7</td>
<td>14.0</td>
</tr>
<tr>
<td>Early elderly (46-55 years)</td>
<td>4</td>
<td>4.7</td>
</tr>
</tbody>
</table>
Based on table 1, the age of most of the early adult category 26-35 years old was 14 (28.0%), the gender of most women was 35 (70%) and the BMI of the most normal was 31 (62%).

Table 2: Shivering incidence distribution

<table>
<thead>
<tr>
<th>Variable</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>occurrence of shivering</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shivering occurs</td>
<td>31</td>
<td>62.0</td>
</tr>
<tr>
<td>No shivering occurs</td>
<td>19</td>
<td>38.0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Berdasarkan tabel diperoleh pasien post operasi bedah abdomen terdapat kejadian shivering sejumlah 31 (62%).

Table 3. Distribution of length of operation

<table>
<thead>
<tr>
<th>Variable</th>
<th>f</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fast &lt; 1 hour</td>
<td>29</td>
<td>58.0</td>
</tr>
<tr>
<td>Medium 1 - 2 hours</td>
<td>21</td>
<td>42.0</td>
</tr>
<tr>
<td>Total</td>
<td>50</td>
<td>100</td>
</tr>
</tbody>
</table>

Based on table 3, it is obtained that the length of operation of postoperative patients with abdominal surgery is the majority in the fast category of less than 1 hour, 29 (58%).

Table 4. Relationship between the length of surgery and the incidence of shivering in abdominal surgery patients

<table>
<thead>
<tr>
<th>Length of operation</th>
<th>Shivering</th>
<th>Total</th>
<th>P_value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
<td>f</td>
</tr>
<tr>
<td>Fast</td>
<td>13</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Medium</td>
<td>18</td>
<td>36</td>
<td>8</td>
</tr>
</tbody>
</table>

Based on table 4, obtained a p-value of 0.004 less than 0.05 so it can be concluded that there is a relationship between the length of surgery with the incidence of shivering of abdominal surgery patients in the Central Surgical Installation of Hj. Anna Lasmanah Banjarnegara Hospital.

Discussions

An overview of the characteristics of patients who underwent abdominal surgery.

The age characteristics of abdominal surgery patients at the Central Surgical Installation of RSUD Hj. Anna Lasmanah Banjarnegara was obtained with the highest age with early adulthood 26-35 years at 28%. Depkes RI (2018) categorises age levels with categories, 0-5 years toddlers, 5-11 years children, 12-16 years early adolescents, 17-25 years late adolescents, 26-35 years early adults, 36-45 years late adults, 46-55 years early elderly, and 56-65 years late elderly and > 65 years elderly.

The patient's age is one of the identification factors related to anatomy, physiology and thermoregulation abilities that differ in each age group(8). This is due to the body's thermoregulatory response to heat and cold which begins to decline in old age, the body's vasoconstriction threshold to temperature changes will decrease in old age by 1 °C when given anesthesia (Tantarto et al., 2016). Age greatly affects the body's metabolism due to hormonal mechanisms that have an indirect effect on body temperature. According to Tartanto (2016) the proportion of postoperative shivering patients is most prevalent in the early elderly age category with an age range of 46-55 years and a percentage of 31.36%(9).
Age is a period since humans were born and can be measured using units of time. It was found that 2.5% of patients experienced complications after undergoing anesthesia. From research(10) patients with early elderly age (46-55 years) are the most patients compared to other age groups, early elderly experience more shivering because at this age there has been a decrease in metabolism so that the ability to maintain body temperature also begins to decrease(11). This happens in accordance with the results of research submitted by Widiyono (2020) that late elderly patients belong to the extreme age group, which is a high risk for hypothermia in the perioperative period (12).

The late elderly are aged 56 - 65 years are very susceptible to shivering this is due to cardiovascular function that begins to decline. The cardiovascular system that begins to decline causes the elasticity of blood vessels to decrease so that it is easy to vasodilate blood vessels when exposed to cold temperatures in the operating room, body heat will come out to adjust the environmental temperature so that patients easily experience hypothermia, and the body will compensate which causes shivering. In the late elderly, the possibility of shivering will be greater than for the early elderly when exposed to cold temperatures in the operating room.

The gender characteristics of abdominal surgery patients in the Central Surgical Installation of RSUD Hj. Anna Lasmanah Banjarnegara obtained the majority were female at 70%. Gender is a biological trait of a person that is inherent in him and permanently unchanged and is a biological provision tool or often said to be God’s provisions or nature according to theory in this case is female and male(13).

Sex differences can be distinguished through the distribution of body fat between men and women, in men the accumulation of abdominal fat is more than women, in addition to higher thermogulation ability and male skin temperature is 1-2°C higher than women. This is related to vasoconstriction which is more pronounced in women, resulting in decreased arterial blood flow to other extremities such as the feet and hands so that women are more vulnerable to cold exposure. This is in line with Yunita's research (2021) that surgery patients in the IBS Room Dr Soebandi were obtained by women, 55 patients (68.8%). In the female gender, there is a lower level of thermoregulation tolerance than men and the skin temperature possessed by women is 1-2 °C lower(14).

The characteristics of BMI of abdominal surgery patients at the Central Surgical Installation of RSUD Hj. Anna Lasmanah Banjarnegara obtained the majority in the normal category at 62%. BMI is a step in monitoring the nutritional status of adults, which is related to underweight and overweight(15). A person's Body Mass Index is obtained from body weight divided by height (kg/m2). BMI has a positive correlation with total body fat, but BMI is not the only indicator for measuring obesity, there are other methods of measuring body anthropometry by measuring abdominal circumference or waist circumference(16).

In line with Widiyono's research (2020), it was found that the majority of respondents had an ideal BMI, as many as 64 people (72.7%)(12).

In the body mass index with a high category of food has a heat protection system as a source of heat-producing energy obtained from thick fat, it makes high BMI will be better at maintaining body temperature than at low BMI due to low energy reserves. A larger body is able to store more fat tissue, which has a positive impact on maintaining body temperature(3).
Body Mass Index (BMI) is a simple tool or way to monitor the nutritional status of adults, especially about underweight and overweight. Body Mass Index is defined as a person's weight in kilograms divided by height in metres (kg/m²) (17).

According to the researchers, patients with low BMI can easily lose heat in the body, thus triggering the risk of shivering. Low BMI has little fat so that the source of heat from the body will certainly be less, fat in the body is useful as an energy reserve and vice versa high BMI will have a lot of energy reserves (18–20).

An overview of the characteristics of the incidence of shivering in postoperative abdominal surgery patients

The incidence of shivering in abdominal surgery patients was 62%. Shivering is a condition that must be dealt with immediately from the onset and should not occur during the surgical process. The conventional explanation of shivering is that anesthesia-induced thermoregulatory barriers suddenly disappear, thus increasing the limit of shivering towards normal and will lead to low body temperature differences (21).

Shivering is a mechanism process by the body to increase heat generation. Inhalation agents cause vasodilatation thereby increasing heat loss (4). The body's reaction when there is a change in temperature is one of the responses to the autonomic nerves and behaviour including sweating, vasoconstriction, and shivering (19,22,23) The appearance of shivering symptoms for each patient has differences in degree and intensity, the response can be seen from the muscles on the face and extends to the neck in the form of masseter muscles, body, and extremities. The event occurs gently and quickly so that it does not become a seizure (24).

An overview of the characteristics of the duration of surgery in postoperative abdominal surgery patients

The characteristics of the length of operation of abdominal surgery patients in the Central Surgical Installation of RSUD Hj. Anna Lasmanah Banjarnegara are the majority with a fast operation time of less than 1 hour, 58%. The length of surgery begins when the patient switches on the surgical table and ends when entering the PACU post-anesthesia care unit (25). The length of the surgical process results in the lengthening of the duration of anesthesia. So that the accumulation of drugs and anesthetic agents in the body becomes more. Surgical action with a long time extends the exposure of the body to cold temperatures (25).

Slow or long operation times spontaneously make the anaesthetic action longer. This condition will take a long time and increase the body's exposure to cold temperatures and lead to the accumulation of drugs and anesthetic agents in the body due to increased time (10).

The use of anaesthetic techniques during surgery has side effects that must be considered. One of them in surgery with anesthesia both general and regional anesthesia is shivering (24). Some of the advantages of anesthesia include preventing intraoperative awareness and prolonged muscle relaxation. In addition, it can be given without changing the patient's supination position, can be adjusted easily if the operation time needs to be extended and can be given quickly and reversibly (23,26,27). Some disadvantages are that it requires more complicated treatment, preoperative patient preparation, the patient may experience physiological fluctuations, nausea and vomiting, sore throat, headache, chills, and slow recovery of normal mental (28–31).

Meanwhile, regional anesthesia has a numbing effect on part of the body,
carried out by injection of local anesthesia with spinal/epidural or with Bier block(24). There are several advantages of regional anesthesia, namely no polypharmacy, an effective alternative to general anesthesia and the patient in a conscious position(24). In line with Yunita's research (2021) that the type of anesthesia does not affect shivering (p value = 0.820), this research is in line with a study by(32) which found that most patients who underwent regional anesthesia did not experience shivering. Similar results were found in Tantarto's research (2016), where the incidence of shivering was smaller than in patients who did not experience shivering, where the percentage of shivering only reached 26.45%, and no difference was found in either general anesthesia patients or regional anesthesia patients. Research conducted by Irawan (2018) found that the percentage of shivering was 16.7%, while the absence of shivering was 83.3%. Anesthesia with general or regional anesthesia has a low percentage of shivering(33).

The relationship between the duration of surgery and the incidence of shivering in abdominal surgery patients

Based on the results of research on the relationship between the length of surgery with the incidence of shivering in abdominal surgery patients obtained a p_value of 0.004 (<0.05) with the strength of the relationship obtained rho 0.416 with a moderate category, so it can be concluded that there is a relationship between the length of surgery with the incidence of shivering in abdominal surgery patients with moderate relationship. Long periods of surgery and anesthesia have the potential to have a major influence that causes the process of continuous loss of body heat. Length of surgery or length of time intraoperatively is when the client is transferred to the operating table and ends when the client enters the PACU post-anesthesia care unit(25). Induction of anesthesia results in vasodilation which causes continuous loss of body heat. Heat is produced continuously by the body because of metabolism. The length of surgery and anesthesia has the potential to have a major influence, especially the use of anaesthetic drugs with higher concentrations in blood and tissues (especially fat), solubility, longer duration of anesthesia, so that these agents must try to reach equilibrium with these tissues(25).

So, the length of surgery can affect the incidence of shivering if the duration of surgery or surgery is longer, it will extend the length of time the body is exposed to the cold temperature of the operating room and accumulate side effects from spinal anesthesia. In general, the precipitating factors that can support the occurrence of shivering are room temperature, length of surgery, type of surgical procedure, intravenous fluids, hydration status, irrigation and administration of anesthesia(34). In line with Mulyandari's research (2020) there is a significant relationship between the length of surgery and the incidence of shivering. The incidence of shivering in general anesthesia patients has a negative impact on patient discomfort, and some patients even state that the cold sensation causes pain in the surgical area to be more pronounced(34).

The duration of surgery is the time required for surgery (Intraoperative) when the client is elevated to the operating table and ends the client enters the PACU post-anesthesia care unit(25). Induction of anesthesia results in vasodilation which causes the process of losing body heat to occur continuously. Heat is produced continuously by the body because of metabolism. The length of surgery and anesthesia can potentially have a large influence, especially anesthetic drugs with
higher concentrations in blood and tissues (especially fat), solubility, longer duration of anesthesia, so these agents must try to reach equilibrium with these tissues(25).

Effective nursing efforts in overcoming shivering of abdominal surgery patients in the Central Surgical Installation (IBS) of Hj. Anna Lasmanah Banjarnegara Hospital. There is careful preparation before surgery that requires a duration of more than 1 hour (60 minutes). The best way is to improve hemodynamics and body metabolism and maintain body temperature during surgery. In line with Hati's research (2021). The longer the surgery lasts, the higher the risk of shivering (Suryaningsih, 2019). In line with Putri's research (2020), the results of statistical tests found a relationship between the length of surgery and the type of surgery with the incidence of shivering (p value <0.05)(7). Millizia's research (2020) was an operation that lasted > 60 minutes. This is because the tissue that is injured during surgery can release pyrogenic substances that can increase the set point in the thermoregulator system which can induce post anesthetic shivering so that the longer the operation is performed, the more the occurrence of post anesthetic shivering will increase(14).

Shivering is the body's defense mechanism against hypothermia. The muscle contractions that occur during shivering generate body heat. In addition, shivering can also increase oxygen consumption and carbon dioxide production. This is dangerous if it occurs especially in surgery patients who have a history of heart and lung disorders. To prevent this, in the operating room of RSUD Hj. Anna Lasmanah Banjarnegara, efforts are needed to control hypothermia. Hypothermia control is carried out starting from when the patient is in the operating room and continuing when the patient is in the recovery room. Actions taken on patients by giving warmed IV fluids and warm blankets to patients. In addition, shivering can also increase oxygen consumption and carbon dioxide production. Patients undergoing surgery need to maintain body stability, both before, during and after surgery.

Hemodynamic stability of the body is intended to ensure a balance between the need and use of oxygen in the body. Giving warm intravenous fluids can increase body temperature in hypothermic patients through a conduction mechanism. Intravenous fluids given in a warm state to hypothermic patients aim to maintain body temperature in normal conditions. This is done by activating both reflex and non-reflex thermoregulatory mechanisms so that autonomic, endocrine and behavioral changes are possible. Meanwhile, almost half of the patients who were given a warm blanket had their body temperature returned to normal after one hour. Blankets can protect patients from exposure to cold room temperatures. Blankets also prevent excessive heat loss, especially in the incision area. Through the provision of warm fluids and warm blankets, it is hoped that the patient's body temperature will be maintained within normal limits.

Limitation

This study did not correlate with other factors such as room temperature, type of anesthesia that might affect the occurrence of shivering in abdominal surgery patients.

Conclusions

The most age in the early adult category (26-35 years) was 14 respondents 28%, the sex of the patients was mostly female at 35 respondents 70% and BMI was found to be the majority in the normal category at 31 respondents 52%, the incidence of shivering in abdominal surgery patients was obtained in 31 patients 62%. Most of the length of surgery in the fast category is 29 patients.
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58%. There is a relationship between the length of surgery and the incidence of shivering in abdominal surgery patients with a p-value of 0.004 (<0.05) with a relationship in the moderate category with rho 0.416.

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