The Relationship Between Age and Duration of Surgery with The Incidence of Post Anesthesia Shivering in Section Caesarean Patients At Hospital Bendan Pekalongan

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Abstract

Background: Shivering is a physiological response to exposure to cold and the body's next steps to maintain heat after peripheral vasoconstriction. The incidence of shivering is caused by several factors including age and length of surgery. Postanesthesia shivering is involuntary oscillatory muscle activity during early recovery after anesthesia. Purpose: This study aims to determine the relationship between age and duration of surgery with the incidence of shivering after anesthesia in caesarean section patients at Bendan Hospital, Pekalongan City. Methods: This research includes quantitative research with the type of analytical correlational observational research with a cross sectional approach. The subjects or samples used were 50 caesarean section patients. Determination of subjects was carried out using consecutive sampling technique. Data collection was carried out using an observation sheet for the degree of shivering. Findings: Based on the research, the results of the Spearman rank test were obtained with a value of (p) 0.0004 < 0.05 between age and the incidence of shivering and p 0.000 < 0.05 between the length of operation and the incidence of shivering. Conclusion: The conclusion of this study is that there is a relationship between age and length of operation and the incidence of post-anesthesia shivering in caesarean section patients.

Keywords: post anesthesia, shivering, caesarean section

Introduction

Caesarean section an operation to remove a baby by making an incision or cutting into the skin, abdominal muscles and mother's uterus. Caesarean section is generally performed when normal vaginal delivery is not possible or because of medical or non-medical indications (1).

Caesarean section is usually performed using regional anesthesia techniques. Spinal anesthesia is a method of injecting surgical anesthesia in the abdominal area and lower extremities by blocking the spinal nerves through the subarachnoid space (2).

In patients given spinal anesthesia, the sympathetic nerves are blocked, resulting in vasodilation which results in a decrease in body temperature. To maintain body temperature, heat transfer or redistribution of heat occurs from the central to the
peripheral. In spinal anesthesia, the sympathetic nerve block is only at the level of the affected segment, so that vasodilation only occurs at the bottom of the block. Apart from that, the block in spinal anesthesia which occurs in the area below the affected segment, allows shivering to occur during surgery, this of course interferes with the operation. Because it causes many losses, this shivering incident must be immediately prevented and resolved (3).

Shivering is a physiological response to cold exposure and the body's subsequent steps to retain heat following peripheral vasoconstriction. Postoperative shivering is involuntary, oscillating muscle activity during initial recovery after anesthesia. Shivering is defined as fasciculations of the face, jaw, head, or muscle hyperactivity that last longer than 15 seconds (4).

Post-anesthesia shivering is usually caused by several factors, including exposure to very cold environmental temperatures, ASA physical status, gender, age, and duration of surgery. The length of the operation spontaneously results in a long anesthesia procedure as well. This will result in increasing the time the body is exposed to cold temperatures and will have the effect of increasing accumulation of drugs and anesthetic agents in the body as a result of prolonged use of anesthetic drugs in the body (5).

This is in line with the theory put forward by (6) that the patient's age can certainly influence the likelihood of shivering. This is related to anatomy, physiology and thermoregulatory abilities which are different in the infant age group to the elderly age group.

The combination of spinal anesthesia and the length of the operation can cause disruption in the function of body temperature regulation which will cause a decrease in core body temperature, thereby causing shivering. The risk of shivering will be higher if the duration of surgery or surgery is longer, because it will increase the time the body is exposed to cold temperatures and cause an accumulation of side effects of spinal anesthesia (7).

The rate of shivering during spinal anesthesia was reported. Based on the results of research at Panti Wilasa Hospital, Semarang, out of 200 caesarean section patients with spinal anesthesia, it was found that 92 patients (46%) experienced shivering. Based on medical record data from Nganjuk Regional Hospital during 2017, the number of patients who underwent surgery was recorded at 2,429 patients. Of this number, 1,158 patients were given spinal anesthesia or an average number of 96 patients. The prevalence of patients who experienced shivering during 2017 was 32% or 371 patients (8).

Based on the results of a pre-survey at Bendan Regional Hospital, Pekalongan City, data was obtained in the central surgical installation that the average incidence of operations with spinal anesthesia in the last month from September to October 2022 was 165 patients. A preliminary study was carried out at the Bendan Regional Hospital, Pekalongan City, observing 5 patients who underwent caesarean section, 3 patients experienced grade 2 shivering, and 2 patients experienced grade 1 shivering with relatively the same age and duration of operation.

Method:
The research method used in this research is quantitative with analytical correlational observational research using a cross-sectional approach. The sampling technique in this study used consecutive sampling of 50 caesarean section respondents. This research has been approved by the research ethics review board of Harapan Bangsa University with number B.LPPM-UHB/2133/07/2023. This research instrument used an observation sheet for Crossley and Mahajan shivering incidents.
Study Design
This analysis uses primary data, namely shivering from the results of observations made on the respondents studied, namely caesarean section patients. Secondary data is age and duration of caesarean section operation. With the inclusion criteria for caesarean section patients, regional anesthesia patients, and ASA I and ASA II patients. The exclusion criteria in this study were ASA III to V patients, patients with general anesthesia, patients who were not willing to be respondents, patients with impaired consciousness (ICU) and emergency patients.

This research was carried out using Crossley and Mahajan shivering degree observation sheets. Observations were carried out in the recovery room, and data on age characteristics and length of operation were taken from the patient’s medical record sheet.

Data Collection and Outcome Measurement
Researchers process data using computer programs, then edit, mark samples, enter data, clean.

This study measured the degree of shivering in caesarean section patients.

Degree of shivering
Grade 0 = no shivering, grade 1 = piloerection/peripheral vasoconstriction but not shivering, grade 2 = muscle activity is limited to one group, grade 3 = muscle activity is limited to more than one muscle group and grade 4 = shivering throughout the body.

Statistical analysis
All statistical analyses in this study used SPSS statistics with Version 25.0; IBM. Analyzing the relationship between age and duration of surgery with the incidence of shivering after anesthesia in caesarean section patients. This research uses univariate and bivariate analysis. For bivariate analysis in this study, the Spearman rank test was used to determine the relationship between independent and dependent variables with ordinal scale data.

Results
Respondents in this study were 50 caesarean section respondents from September 16 to October 5, 2023.

Table 1. Frequency Distribution of Respondent Characteristics Based on Age, Length of Operation, and Degree of Shivering of Respondents Who Underwent Sectio Caesarea Surgery at the Bendan Regional Hospital, Pekalongan City (n=50)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Age</td>
<td></td>
</tr>
<tr>
<td>17-25</td>
<td>12</td>
</tr>
<tr>
<td>26-35</td>
<td>34</td>
</tr>
<tr>
<td>36-45</td>
<td>4</td>
</tr>
<tr>
<td>Operation Time</td>
<td></td>
</tr>
<tr>
<td>Fast (&lt;1 hour)</td>
<td>32</td>
</tr>
<tr>
<td>Medium (1-2 hours)</td>
<td>14</td>
</tr>
<tr>
<td>Long (&gt;2 hours)</td>
<td>4</td>
</tr>
<tr>
<td>Shivering</td>
<td></td>
</tr>
<tr>
<td>Degree 0</td>
<td>22</td>
</tr>
<tr>
<td>Degree 1</td>
<td>10</td>
</tr>
<tr>
<td>Degree 2</td>
<td>12</td>
</tr>
<tr>
<td>Degree 3</td>
<td>6</td>
</tr>
</tbody>
</table>

Based on the table above, it can be seen that the age variable is divided into 3 categories, namely age (17-25 years) totaling 12 (24%), age (26-35 years) totaling 34 (68%), and age (36-45 years) totaling 4 (8%). Based on the table above, it can be seen that the operation time variable is divided into 3 categories, namely fast (<1 hour) totaling 32 (64%), medium (1-2 hours) totaling 14 (28%), and long (>2 hours) totaling 4 (8%). Based on the table above, it can be seen from the variable degree of shivering that respondents with degree 0 shivering numbered 22 (44%), respondents with degree 1 shivering numbered 10 (20%), and respondents with degree 2 shivering numbered 12 (24%), and respondents with Grade 3 shivering amounted to 6 (12%).
Table 2. Frequency Distribution of Spearman Rank Test Analysis Results of the Relationship between Age and Post-Anesthesia Shivering in Sectio caesarea Patients at Bendan Regional Hospital, Pekalongan City (n = 50)

<table>
<thead>
<tr>
<th>Age</th>
<th>Degree 0</th>
<th>Degree 1</th>
<th>Degree 2</th>
<th>Degree 3</th>
<th>Total</th>
<th>Correlation coefficient</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F %</td>
<td>F %</td>
<td>F %</td>
<td>F %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17-25 Years</td>
<td>7 14.0</td>
<td>3  6.0</td>
<td>2  4.0</td>
<td>0  0.0</td>
<td>24.0</td>
<td>0.396</td>
<td>0.004</td>
</tr>
<tr>
<td>26-35 Years</td>
<td>15 30.0</td>
<td>7  14.0</td>
<td>10 20.0</td>
<td>2  4.0</td>
<td>68.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>36-45 Years</td>
<td>0  0.0</td>
<td>0  0.0</td>
<td>0  0.0</td>
<td>4  8.0</td>
<td>8.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22  44.0</td>
<td>10 20.0</td>
<td>12 24.0</td>
<td>12 24.0</td>
<td>50 100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on table 2, it can be seen that the percentage of shivering incidents with the age of 50 respondents, the most respondents experienced grade 2 shivering with the age of 26-35 years as many as 10 respondents (20.0%). The results of the Spearman rank test obtained a p-value = 0.004 which shows that there is a significant relationship between the age variable and the incidence of shivering after anesthesia. In this study, the correlation coefficient value obtained was 0.396. It can be stated that the correlation (relationship) between the age variable and the incidence of post-anesthesia shivering has a weak and positive/unidirectional correlation.

Table 3. Frequency Distribution of Spearman Rank Test Analysis Results of the Relationship between Operation Length and Post-Anesthesia Shivering in Sectio Caesarea Patients at Bendan Regional Hospital, Pekalongan City (n = 50)

<table>
<thead>
<tr>
<th>Length of operation</th>
<th>Degree 0</th>
<th>Degree 1</th>
<th>Degree 2</th>
<th>Degree 3</th>
<th>Total</th>
<th>Correlation coefficient</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F %</td>
<td>F %</td>
<td>F %</td>
<td>F %</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fast</td>
<td>21 42.0</td>
<td>8 16.0</td>
<td>2  4.0</td>
<td>1  2.0</td>
<td>64.0</td>
<td>0.731</td>
<td>0.000</td>
</tr>
<tr>
<td>Currently</td>
<td>1  2.0</td>
<td>2  4.0</td>
<td>10 20.0</td>
<td>1  2.0</td>
<td>28.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Long</td>
<td>0  0.0</td>
<td>0  0.0</td>
<td>0  0.0</td>
<td>4  8.0</td>
<td>8.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22  44.0</td>
<td>10 20.0</td>
<td>12 24.0</td>
<td>12 24.0</td>
<td>50 100.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Based on table 3, it can be seen that the percentage of shivering incidents with the length of operation of the 50 respondents, the most respondents experienced grade 2 shivering with a medium length of operation, were 10 respondents (20.0%). The results of the Spearman rank test obtained a p-value = 0.000 which shows that there is a relationship. significant relationship between the variable length of operation and the incidence of post-anesthesia shivering. In this study, the correlation coefficient value obtained was 0.731. It can be stated that the correlation (relationship) between the operation duration variable and the incidence of post-anesthesia shivering has a moderate and positive/unidirectional correlation.

Discussion

Based on the age table above, it shows that the majority of respondents who underwent caesarean section surgery at Bendan Pekalongan Regional Hospital were adults aged 26-35 years, 34 respondents (68%). This is in line with research conducted by (9), which showed that 42% of people aged 26-35 years had the highest number of caesarean section operations. Researchers assume that at the age of (26-35) years many female patients undergo caesarean section surgery because they are of productive age and at the age of (36-45) years the majority of respondents who undergo caesarean section surgery are giving birth to their third child.
2. Operation Time
Based on the surgery time table, it shows that the majority of respondents who underwent caesarean section surgery at the Bendan Pekalongan Regional Hospital with a quick surgery time of <1 hour were 32 respondents (64%). These results are in line with research by Rante et al., (2022), as many as 78 people (100%). Of the 78 patients (100%) caesarean section had an operation time of <60 minutes. Researchers assume that most caesarean section operations are procedures that last < 1 hour, while the few patients who undergo caesarean section operations take 1-2 hours or > 2 hours due to problems during the surgical procedure.

3. Shivering
Based on the shivering table, it can be seen from the shivering degree variable that most respondents experienced grade 2 shivering with the number of respondents being 12 (24%). This is also in line with research by (10), which showed that the majority of caesarean section patients, 33, experienced grade 2 shivering, 10 patients (33.3%).

Based on these data, it can be concluded that the highest incidence of shivering is found at Shivering degree 2. This is in line with research by (11), regarding the relationship between the length of surgery and the incidence of post-operative shivering, that the number of shivering incidents at RSUD Dr. RM Pratomo shows that Most of the 75 respondents did not experience shivering, 26 (34.7%) and a small number experienced grade 4 shivering, 3 (4%) with a p-value = 0.000.

This is in line with research by (12) the number of cases of Shivering after spinal anesthesia at Karawang District Hospital shows 19 Shivering incidents from a total sample of 65 people with the majority of 11 patients being women, and the majority of patients experiencing grade 2 Shivering, of these 19 incidents. There are 6 types of surgical procedures and the one that most often shows Shivering is caesarean section surgery.

In spinal anesthesia, the sympathetic nerve block is only at the level of the affected segment, so that vasodilation only occurs at the bottom of the block. Apart from that, the block in spinal anesthesia which occurs in the area below the affected segment, allows shivering to occur during surgery, this of course interferes with the operation. Because it causes many losses, this shivering incident must be immediately prevented and resolved (11).

According to (13) stated that the occurrence of Shivering 2 and 3 is still at a normal level where only a few of the client's muscles experience Shivering, not the entire body. The physical endurance of surgery clients with spinal anesthesia which was able to survive Shivering 2 and 3 could be due to the fact that the majority of respondents who were adults at this age had good physical stamina and were resistant to a decrease in temperature threshold as a result of spinal anesthesia.

Shivering after anesthesia can occur due to several factors, including exposure to cold environmental temperatures, ASA physical status, age, nutritional status and low body mass index, gender, length of operation and amount of bleeding (10).

The Relationship between Age and the Occurrence of Shivering After Anesthesia in Sectio Caesarea Patients at the Bendan Regional Hospital, Pekalongan City
The results of the test for the relationship between age and the incidence of shivering after anesthesia using the Spearman rank test showed a p-value of 0.004 (p < 0.05). It can be concluded that the significant value is <0.05, so the hypothesis is accepted, namely that there is a relationship between age and the incidence of post-anesthesia shivering in caesarean section patients at Bendan Pekalongan Regional Hospital.
The level of closeness between age and the incidence of shivering after anesthesia with the correlation coefficient value obtained is 0.396. It can be stated that the correlation (relationship) between the variable age and the variable the incidence of shivering after anesthesia has a weak closeness and a positive / unidirectional relationship.

This is in accordance with research by (9), conducted at the central surgical installation of PPK BLUD Cut Meutia Hospital, North Aceh. It was found that the highest incidence of shivering was in the adult category with results of 15 out of 31 respondents experiencing shivering or 48.4% with results p-value = 0.000. However, in research by (14) which was carried out in the recovery room at Hasan Sadikin Hospital in Bandung, it was found that the highest incidence of shivering was in the elderly category with a percentage of 31.36%. Differences in research results may occur due to differences in the characteristics of respondents, types of operations and different management of shivering in each hospital.

This is in line with the theory put forward by (15) that the patient's age can certainly influence the likelihood of shivering. This is related to anatomy, physiology and thermoregulatory abilities which are different in the infant age group to the elderly age group. This is related to vasoconstriction which is more visible in women so that it can reduce arterial blood flow to the extremities making them more susceptible to cold. Women's fat distribution can be one of the causes of women's susceptibility to post-anesthetic shivering.

This post-anesthesia shivering incident can be triggered by hypothermia in the body caused by vasodilation and loss of body thermoregulation. This is supported by (14) who said that the high incidence of shivering after anesthesia is due to the fact that anesthesia can cause disturbances in the body's thermoregulation, where there is an increase in the threshold value of the body's response to heat and a decrease in the threshold value of its response to cold.

**The Relationship between Length of Operation and the Event of Shivering After Anesthesia in Sectio Caesarea Patients at Bendan Regional Hospital, Pekalongan City**

The results of the test for the relationship between the length of surgery and the incidence of shivering after anesthesia using the Spearman rank test showed a p-value of 0.000 (p < 0.05). It can be concluded that the significant value is <0.05, so the hypothesis is accepted, namely that there is a relationship between the length of operation and the incidence of post-anesthesia shivering in caesarean section patients at the Bendan Pekalongan Regional Hospital.

The level of closeness between the duration of surgery and the incidence of shivering after anesthesia with the correlation coefficient value obtained is 0.731. It can be stated that the correlation (relationship) between the variable length of operation and the variable the incidence of shivering after anesthesia, has a moderate relationship and a positive / unidirectional relationship.

According to research conducted by (12) an operation lasting 31-60 minutes is a medium level operation and an operation lasting more than 60 minutes is a major operation with a risk of grade 3 shivering, conversely, the shorter the operation, undergoing it will reduce the risk of shivering. And in the research, it was stated that 8 out of 27 respondents (29.6%) experienced grade 3 shivering with a p-value of 0.002.

Based on research by (4) the length of surgery that most often causes post anesthetic shivering in this study is surgery that lasts >60 minutes. This is because tissue injured during surgery can release
pyrogenic substances which can increase the set point in the thermoregulatory system which can induce post anesthetic shivering so that the longer the operation is carried out, the more post anesthetic shivering will occur.

The risk of shivering will be higher if the duration of the operation or surgery is longer, because this will increase the time the body is exposed to cold temperatures and cause an accumulation of side effects of spinal anesthesia. This generally occurs in medium or large types of surgery that take more than 1 hour (60 minutes) (3)

According to research by (6), there is a relationship between the long duration of anesthesia and surgery and the emergence of shivering. The longer the duration of anesthesia and surgery, the lower the body temperature can be, which can trigger shivering. This is because respondents were exposed to cold room temperatures for longer, and were not given blankets to cover their hands, shoulders and neck during surgery.

**Conclusion**

There is a relationship between age and the incidence of post-anesthesia shivering in caesarean section patients at Bendan Hospital, Pekalongan City. Based on the Spearman rank test, a p-value of 0.004 (a < 0.05) was obtained. The conclusion was that there was a relationship between age and the incidence of post-anesthesia shivering in caesarean section patients at Bendan Hospital, Pekalongan City. With a correlation coefficient value of 0.396 with weak information and a positive/unidirectional relationship.

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**References**


Age, duration of surgery and incidence of shivering

Ficky et al.


