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Overview of Shivering in Sectio Caesarea Patients Using Pethidine Therapy in Intraoperative with Spinal Anesthesia at Pandega Pangandaran Hospital

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Abstract
Introduction: *Shivering is an unpleasant and frequent complication, the incidence is around 40-60% of cases after spinal anesthesia in section Caesarea patients. Small doses of 10-25 mg of pethidine are often used to treat shivering after spinal anesthesia.* ***Objective****: This therapy pethidine in section Caesarea patients who experienced shivering intraoperatively at Pandega Hospital Pangandaran.* ***Method****: This research method is descriptive quantitative with total sampling data collection technique of as many as 25 sections of Caesarea patients who experience shivering. Data were collected by observing the patient's age, duration of surgery, the onset of shivering, the onset of pethidine, and the degree of shivering.* ***Result and Discussion****: The results showed that pethidine was effective in reducing shivering reactions in 25 patients (100%), where patients who experienced shivering after 10 minutes of pethidine therapy became shivering degrees 0 and 1,* ***Conclusions****: Therefore, pethidine can be used as anti-shivering therapy. in addition to other drugs.*

Keywords: Shivering; Pethidine; Section Caesarea;

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Introduction

According to Lestari 2009, Sectio Caesarea (English: cesarean section or cesarean section in English-American), also known as c-section is the process of removing the baby where an incision is made in the pregnant woman's abdomen (laparotomy) and uterus (hysterotomy). Sectio Caesarea is generally carried out when vaginal delivery is not possible because of the risk of medical complications for the mother and fetus. Sectio Caesarea procedure is generally carried out by a team of doctors consisting of obstetricians, pediatricians, anesthesiologists, nurses, and midwives. (Ningsih., 2010)

Globally, spinal or epidural anesthesia techniques are recommended by the Obstetric Anesthesia Guidelines compared to general anesthesia for most cesarean sections. In the United States in 1992, spinal anesthesia was used in more than 80% of cesarean sections, regardless of the indication for pregnancy. The reason for recommending regional anesthesia during cesarean section is to minimize the risk of failed endotracheal intubation and the possibility of aspiration when performed under general anesthesia. Regional anesthesia provides several advantages, including the mother will remain awake during the operation, reducing the possibility of aspiration, and avoiding depression. Neonates (Flora et al., 2014)

During pregnancy, there is an increase in basal metabolism of up to 15%. Apart from being a risk factor for causing hypothermia, the incision of the abdomen and uterine wall in section Caesarea causes an increase in body exposure to a cold environment thereby accelerating the increase in heat reduction to the external environment which accelerates the decrease in core temperature and causes shivering (Masyitah et al., 2014)

The reason for the occurrence of shivering in spinal anesthesia is unclear, shivering is a repetitive muscle contraction as a protective reflex to increase heat production. In a cold environment, body temperature is maintained by the sympathetic effect of vasoconstriction. Spinal anesthesia causes sympathetic nerve block at the level of the affected segment, causing vasodilation in the area affected by the block. To maintain body temperature, there is a redistribution or a flow of heat transfer from the area that is not affected by the block to the area that is affected by the block, therefore it is necessary to increase heat production in the area that is not affected by the block (Islami and Budiono, 2012)

Shivering is an unpleasant and frequent complication, the incidence is around 40-60% of cases after spinal anesthesia. Many drug interventions have been studied, but their effectiveness in preventing shivering is still unclear (Nazma, 2008). Small doses of 10-25 mg pethidine are often used for post-anesthesia shivering. Pethidine 25 mg intravenously is effective and commonly used to treat shivering after spinal anesthesia, but pethidine to treat shivering has been reported to have specific side effects such as sedation, euphoria, respiratory depression, pruritus, nausea, hypotension, bronchospasm, bradycardia, and respiratory depression (Bhukal et al., 2011)

The results of the research by (Masyitah et al., 2014) on patients with cesarean section after spinal anesthesia who shivered at the Arifin Achmad Hospital, Riau

Province, were as many as 30 patients. the effectiveness of giving pethidine in reducing the shivering reaction in section Caesarea patients after spinal anesthesia with pethidine 25 mg intravenously was effective in overcoming shivering in 30 patients (100%). On pethidine, 16 patients (47%) had stopped shivering and 14 patients (53%) had stopped shivering after 25 mg intravenously. After the operation ended, 2 patients experienced repeated chills.

Shivering intraoperatively is very dangerous for patients undergoing spinal anesthesia, which can cause complications such as hypotension and hypothermia. Hypothermia occurs when body temperature is below 360C due to decreased body metabolism during surgery, duration, and type of surgery performed, and exposure of the body to room temperature. When hypothermia occurs, other body systems will experience disturbances, for example in the heart, ischemia will occur, and may also experience arrhythmias (Qona'ah et al., 2019)

Oxygen requirements increase up to one hundred percent in hypothermic patients. The patient will show signs and symptoms in the form of changes in skin color to pale and feeling cold to the touch, shivering or shivering and a decrease in consciousness can occur if not immediately get treatment. Shivering is a defense mechanism of the body against hypothermia. Muscle contractions that occur during shivering produce body heat (Qona'ah et al., 2019)

In addition, shivering can also increase oxygen consumption and carbon dioxide production. This is dangerous if it occurs especially in surgical patients who have a history of heart and lung disorders. To prevent this, it is necessary to control hypothermia. Hypothermia control was carried out starting from the time the patient was in the operating room and continued when the patient was in the recovery room. Actions that can be taken care for example by providing drug therapy, warmed infusion fluids, and warm blankets to patients.

From the results of a preliminary survey conducted at the Central Surgical Installation of Pandega Hospital, Kab. Pangandaran, West Java. The latest data obtained in November 2021, namely the number of sections Caesarea patients as many as 105 patients, 75 patients experiencing shivering during intraoperative with spinal anesthesia and receiving pethidine intravenous the 75 patients who experienced shivering during intraoperatively, 50 were cito or emergency patients and the remaining 25 were elective. Shivering that occurs can interfere with the operation and slow down the patient's recovery in the recovery room.

Based on the description above, the researcher is interested in knowing how the description of the effectiveness of giving pethidine to eliminate intraoperative shivering is described in the form of a final project with the title description of giving pethidine to the incidence of shivering during intraoperatively in section Caesarea patients with spinal anesthesia at Pandega Hospital, Kab. Pangandaran.

Method

This research is descriptive quantitative research. Quantitative research is defined as research based on the philosophy of positivism, used to examine certain populations or samples, data collection using research instruments, and statistical data analysis with the aim of describing and testing predetermined hypotheses. The philosophy of positivism views reality, symptoms, phenomena that can be classified, as relatively fixed, concrete, observable, measurable, and causal relationships (Sugiyono, 2020)

The population in this study were all patients who were registered as elective patients to undergo sectio Caesarea surgery and experienced intraoperative shivering and received pethidine for treatment at Pandega Pangandaran Hospital with a total of 25 patients for 1 month from 10 June 2022 to 11 July 2022. The

sampling technique used in this study is the total sampling method. Total sampling is a sampling technique where the number of samples is the same as the population (Sugiono, 2007). The reason for taking total sampling according to Sugiono (2007) is because the total population is less than 100, so the entire population is used as the research sample.

Result and Discussion

Result

The research was conducted at IBS RSUD Pandega Pangandaran. This study was initiated in the pre-anesthesia phase to assess the respondent's eligibility and consent continued in the intraoperative phase to carry out the study.

The research results obtained from this study can be seen in the frequency distribution tables below:

1. Identify the age range of patients who experience *shivering* during cesarean section with spinal anesthesia

Table 1

Distribution of frequency Age of cesarean section patients after spinal anesthesia who experienced intraoperative shivering at IBS Pandega Pangandaran Hospital in June 2022 (n = 25)

No	Age	Frequency (n)	Percentage (%)
1	17 – 25	2	8%
2	26 – 35	6	24 %
3	36 - 45	17	68 %
Total		**25**	**100 %**

Based on table 1, the percentage in the age range of 17-25 years is 8%, 26-25 years is 24% and most respondents experience *shivering* in the age range 36-45 years, as many as 17 people (68%).

2. Identify the length of operation time in patients who experience *shivering* during cesarean section with spinal anesthesia

Duration of surgery for cesarean section patients after spinal anesthesia who experienced intraoperative shivering at IBS RSUD Pandega Pangandaran in June 2022 (n = 25)

Table 2
Frequency distribution

No.	Duration of operation	Frequency (n)	Percentage (%)
1	< 60 minutes	5	20 %
2	60 – 120 minutes	19	76 %
3	>120 minutes	1	4 %
Total		**25**	**100 %**

Based on table 2 the percentage of the operation duration is less than 60 minutes as much as 20%, more than 120 minutes as much as 4% and the most respondents experiencing *shivering* are patients who undergo surgery for 60-120 minutes, as many as 19 people (76%).

3. Identification of the onset of *shivering* after spinal anesthesia was carried out in section Caesarea patients

Table 3
Distribution of the frequency of onset of *shivering* in patients with sectio Caesarea after intraoperative spinal anesthesia at IBS Pandega Hospital Pangandaran in June 2022 (n = 25)

No	Onset *shivering*	Frequency (n)	Percentage (%)
1	0 - 15 minutes	2	8 %
2	16 - 30 minutes	20	80 %
3	31 - 45 minutes	3	12 %
Total		**25**	**100 %**

Based on table 3, the percentage of *shivering* with a time span of 0-15 minutes is 8%, 31-45 minutes is 12% and most respondents experience shivering after spinal anesthesia is given in the 16-30 minute's time group, which is as many as 20 people. (80%).

4. Therapy pethidine in patients experiencing *shivering* in section Caesarea patients with spinal anesthesia

Table 4

Distribution of the frequency of onset of *shivering* in section Caesarea patients with spinal anesthesia during intraoperative IBS Pandega Pangandaran Hospital in June 2022 (n = 25)

No	Onset of pethidine	Frequency	Percentage (%)
1	1 - 5 minutes	24	96 %
2	6 – 10 minutes	1	4 %
Total		**25**	**100 %**

Based on table 4 the percentage of onset of pethidine with a time span of 1-5 minutes is 4% and the number of respondents whose chills are resolved after giving pethidine 1-5 minutes is 24 people (96%).

5. Identification of the degree of *shivering* after administration of pethidine

Table 5

Distribution of the frequency of *shivering* therapy pethidine in section Caesarea patients with spinal anesthesia during intraoperatively at IBS Pandega Pangandaran Hospital in June 2022 (n = 25).

No	Degree of shivering	Frequency	Percentage (%)
1	0	6	24 %
2	1	19	76 %
3	2	-	0 %
4	3	-	0%
5	4	-	0 %
Total		**25**	**100 %**

Degree group *shivering* 0 was 24% and respondents who experienced *shivering* after pethidine were the most in the group, namely 19 people (76%). As for the degree of shivering 2, 3, 4, and 5, none of the respondents experienced it.

Discussion

1. Identify the age range of patients who experience *shivering* during cesarean section with spinal anesthesia

Based on the results of the study in Table 1 at Pandega Pangandaran Hospital, it was found that *shivering* occurred mostly in respondents with late adulthood (36-45 years) as many as 68% and in early adulthood as many as 24%.

The higher the age of the respondent, the higher the risk of experiencing *shivering*. This is in accordance with the results of research proposed by (Harahap et al., 2014), elderly patients belonging to the extreme age group, are at high risk for hypothermia in the perioperative period. Anesthesia performed on elderly patients can also cause a shift in the thermoregulatory threshold to a greater degree than in younger patients.

This is in accordance with the theory which states that the age factor can affect the body's metabolism due to hormonal metabolism, thus giving an indirect effect on body temperature (Tamsuri, 2006). Core body temperature will decrease by 0.003^0 C for each increase in age (Frank, 2000). In the study of (Nugroho et al., 2016), late adults experience *shivering more* than other ages. Age can affect the occurrence of post-anesthesia *shivering*, where the threshold for *shivering* in old age is lower than 1^0C.

In this study, researchers argue that the older the age, the lower the core body temperature will be because at this age the metabolism begins to decline so that the ability to maintain body temperature also begins to decrease.

2. Identify the length of operation time in patients who experience *shivering* during cesarean section with spinal anesthesia

The duration of surgery in this study was calculated from the time the first incision was made (*timeout*) until the patient was transferred to the recovery room which was expressed in hours. The Indonesian Ministry of Health (2009) divides operations based on their duration into 3 classifications, namely fast (<1 hour), moderate (1-2 hours), and long (>2 hours).

Based on table 2 the duration of surgery, it can be seen that all respondents who underwent surgery for 60 - 120 minutes experienced *shivering* as many as 19 respondents (76%). This is in accordance with the theory of the Indonesian Ministry of Health (2008), which states that a long duration of the surgery will cause anesthesia to be longer and increase the time the body is exposed to cold temperatures in the operating room.

Induction of anesthesia causes vasodilation which causes the process of body heat loss to occur continuously. Heat is produced continuously by the body as a result of metabolism. The process of production and expenditure of heat is regulated by the body in order to maintain core body temperature in the range of 36-37.5ºC (Putzu, 2007). Therefore, patients who undergo surgery and anesthesia for a longer time will lose heat continuously and are more at risk of experiencing *shivering.*

Respondents who underwent surgery >60 minutes experienced *shivering*, this is in line with research which stated that the incidence of *shivering* after spinal anesthesia was most common in respondents who underwent surgery with a duration of 61-120 minutes

(Madjid, 2014). The results of the above study are related to the theory of Vanessa de Brito et al (2009) explaining that there is a relationship between the duration of anesthesia and the onset of hypothermia. The longer the duration and operation, the lower the body temperature, which can trigger *shivering*.

Researchers believe that the longer the operation, the more *shivering* during surgery because the skin is exposed to cold temperatures for too long. The temperature in the operating room of Pandega Pangandaran General Hospital is 18^0 C, so it can increase the risk of *shivering*. This is in accordance with the theory which states that operating rooms with temperatures less than C^{200}can cause a decrease in body temperature (Frank, 2008).

3. Identification of the onset of *shivering* after spinal anesthesia was performed in cesarean section patients

Onset *shivering* in this study was calculated from the patient receiving spinal action until the occurrence of *shivering* in the section Caesarea patient. Based on table 3, shows that *shivering* in the period 16-30 minutes after giving spinal anesthesia, to as many as 20 people (80%), then followed by 31-45 minutes after spinal surgery to as many as 3 people (12%) and 0 – 15 minutes after spinal anesthesia as many as 2 people (8%).

The results of this study are in accordance with the research that has been carried out at the Arifin Achmad Riau Hospital which showed that the incidence of *shivering* most in the 16-30 minutes after the patient received spinal anesthesia (Masyitah et al., 2014). However, in other studies, the highest incidence of *shivering* occurs 45-60 minutes after spinal anesthesia (Parsa Tahereh et al 2007).

This difference is due to several factors including differences in core body temperature and differences in the perception of each person's body towards cold (Miller RD., 2010). Differences in infusion fluids and irrigation using cold or warm fluids that are given are also factors that influence the differences in the results of this study, wherein Pandega Pangandaran Hospital, fluids for infusion and irrigation of surgical wounds use cold fluids, administration of infusion fluid therapy and irrigation uses fluids with cold temperatures. will cause a decrease in body temperature, this may be due to the high block of spinal anesthesia and an increase in the average cold sensation (Syam et al., 2013)

The researcher also believes that in addition to the differences mentioned above, other factors that influence the difference in these results are differences in operating room temperature, wherein Pandega Pangandaran Hospital the operating room temperature is at 18^0C factor *shivering* appears more quickly.

4. Identification of onset of pethidine on *shivering* therapy was given pethidine to section Caesarea patients with spinal anesthesia

The onset of pethidine in this study was calculated from the patient experiencing *shivering* and receiving pethidine therapy to eliminate the *shivering*. Based on table 4, it can be seen that the patients began to lose *shivering after* receiving pethidine therapy for

a period of 0-5 minutes, namely as many as 24 people (96%) followed by 6-10 minutes by 1 person (4%).

This is in accordance with several previous studies, including research from Konrad R, Schwarzkopf G, and Hoff Hansjoerg et al., 2001 which showed that the incidence of shivering stopped 5 minutes after giving pethidine 25 mg intravenously. Other studies have also demonstrated the onset of pethidine 25 mg intravenously for the relief of chills within 5–10 minutes after pethidine administration. (Kranke Peter et al., 2002).

Theoretically, pethidine has an analgesic function from the opioid group which is most widely used to relieve perioperative pain (Tampubolon et al., 2015). The mechanism of pethidine as an anti-shivering can be explained by the action of pethidine which inhibits the reuptake of biogenic monoamine, NMDA (N-methyl d-aspartate) receptor antagonist or stimulation of 2 receptors. Pethidine is a synthetic opioid agonist that acts on both - and k-receptors and is a derivative of phenylpiperidine. Pethidine lowers the shivering threshold twice compared to the vasoconstriction threshold (Mansur et al., 2015)

Pethidine is indicated for perioperative analgesia, moderate to severe pain management, adjuvant anesthesia, and anti-shivering. The contraindication of this drug is that Pethidine is contraindicated in patients with hypersensitivity to this drug. Pethidine is also contraindicated in patients taking MAOIs, such as *selegiline* and *phenelzine* because it can cause fatal reactions even if applied at therapeutic doses within 14 days. The mechanism of this reaction is not known with certainty, but it is thought to be due to hyperphenylalaninemia. The effects may include coma, severe respiratory depression, cyanosis, hypotension, and narcotic overdose syndrome. Another contraindication is in patients with asthma acute or severe uncontrolled bronchial paralytic ileus (*National Center for Biotechnology Information., 2022)*.

Pethidine has a rapid onset of action which makes it more susceptible to abuse than other opioids. In terms of efficacy, pethidine is less potent and has a relatively short duration of action than morphine. Pethidine metabolism produces normeperidine which is neurotoxic and has a longer half-life of 15-30 hours. Normeperidine accumulation has been associated with delirium and seizures (Friesen et al., 2016)

Researchers think pethidine is very effective for relieving chills because it only takes less than 5 minutes to get its effect. This opinion is supported by the results of research by Sri Utari, Sony, Dewi (2014) which showed that Pethidine 25 mg intravenously was effective in overcoming chills in 30 patients (100%).

However, pethidine has side effects in its administration, including allergies, increased pulse rate, nausea and vomiting, and respiratory depression. Although pethidine is able to prevent the occurrence of shivering, it still feels unsatisfactory because of the adverse side effects of pethidine so other alternative drugs are needed that have greater effectiveness than pethidine in preventing the occurrence of shivering (Gunadi et al., 2015)

5. Identify the degree of *shivering* after administration of pethidine.

The level or degree of *shivering* calculated in this study was in patients who experienced shivering and then received pethidine for treatment, after that they waited for 10 minutes and reassessed the degree of *shivering* experienced by the patient. Based on table 5, it can be seen that patients who received a *shivering* "1" after giving pethidine for 10 minutes were the largest group, namely 19 people (76%), followed by the next order of *shivering* "0" as many as 6 (24%), while for the degree of *shivering* "2,3, and 4" none of the patients experienced it.

According to Crossley & Mahajan (1994) Grade "1" indicates piloresis (the erection of hair follicles due to sympathetic stimulation), but no shivering is seen. While the degree of shivering "0" indicates the absence of *shivering*.

This study is in accordance with the results of previous research from Sri Utari, Sony, and Dewi (2014) with the title "Overview of the effectiveness of pethidine 25 mg to reduce the shivering reaction after spinal anesthesia" with the result that Pethidine 25 mg intravenously was effective in overcoming shivering in 30 patients (100%). On pethidine, 16 patients (47%) had stopped shivering and 14 patients (53%) had stopped shivering after giving 25 mg intravenously for less than 5 minutes.

Based on the results above, the researcher argues that the effectiveness of pethidine to reduce the patient's shivering degree to degrees 0 and 1 in a short time of 10 minutes because the pethidine works in the hypothalamus where the core point of shivering is also in the hypothalamus. Hypothalamic stimulation of *shivering* is located in the dorsomedial portion of the posterior hypothalamus near the wall of the third ventricle, an area known as the primary motor center for *shivering*. The effect of hypothalamic temperature on body heat loss through evaporation and heat generation is mainly caused by muscle activity and *shivering* (Guyton & Hall, 2014).

Conclusion

Most of the respondents who experienced shivering during intra-operative sectio caesarea with spinal anesthesia were in the late adult age range (36 – 45 years) as many as 65.2% of respondents. Most of the respondents who experienced shivering during intra-operative sectio caesarea with spinal anesthesia were in the 60-120 minutes operation time span as many as 74% of the respondents. Most of the respondents experienced the onset of shivering after receiving spinal anesthesia at 16 to 30 minutes, as many as 78.3% of respondents. Most of the respondents had onset of pethidine where the shivering decreased and disappeared at 0 to 5 minutes after giving pethidine, as many as 95.6% of respondents. Most of the respondents received a shivering degree of "1" after receiving pethidine and were observed for 10 minutes after giving pethidine, with a total of 74% of respondents.

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