

The Effect of Giving a Hot Pack to Grade Shivering in Post-Operative Patients Following a Cesarean Section in the Recovery Room

El efecto de administrar una compresa caliente para atenuar los escalofríos en pacientes posoperados después de una cesárea en la sala de recuperación

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SUMMARY

Introduction: Shivering is a complication that often results from spinal anesthesia due to postoperative hypothermia. Risk factors for shivering include age, the length of the operation, the operating room temperature, type of anesthesia, and having a low body mass index. One way to reduce shivering is by giving hot packs with a temperature $<36^{\circ}\text{C}$. The purpose of this study was to determine the effect of hot packs in response to shivering in post-caesarean section surgery patients.

Methods: The research consisted of a pre-experimental with a one-group pretest-posttest design. The population in this study was all of the post-operative cesarean section patients in the Recovery Room of

Siti Khodijah Hospital Muhammadiyah Cabang Sepanjang. The 25 patients making up the study sample was determined using the consecutive sampling technique over 2 weeks. Providing hot packs was the independent variable and shivering grades was the dependent variable. Hot packs with closed packaging at a temperature of 40°C were placed on the right and left arm of the patient and left for about 15 minutes followed by a re-evaluation of the body temperature and the determination of the shivering grade in the sample. Data analysis was performed using the Wilcoxon Signed-Rank statistical test.

Results: The results showed a $p\text{-value} = 0,0001 < \alpha = 0.05$. This means that there is a significant effect due to giving hot packs in terms of a change in body temperature. There were also differences before the treatment by 1 shivering grade for 20 samples and 2 shivering grades for 5 samples. After being given the treatment, the shivering grade changed by 0 for 20 samples and by 1 shivering grade for 5 samples.

Conclusion: This study concluded that the administration of hot packs caused a reaction in the skin receptors and channeled the effects of a hypothalamic temperature through evaporation to reduce the shivering grade.

Keywords: Caesarian section, Hot pack, Shivering grade.

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RESUMEN

Introducción: Los escalofríos son una complicación que muchas veces resulta de la raquianestesia por hipotermia postoperatoria. Los factores de riesgo

de los escalofríos incluyen la edad, la duración de la operación, la temperatura del quirófano, el tipo de anestesia y tener un índice de masa corporal bajo. Una forma de reducir los escalofríos es administrar compresas calientes con una temperatura $<36^{\circ}\text{C}$. El propósito de este estudio fue determinar el efecto de las compresas calientes en respuesta a los escalofríos en pacientes que se sometieron a una operación de cesárea.

Métodos: La investigación consistió en un diseño pre-experimental con un grupo de pretest-postest. La población de este estudio fueron todas las pacientes postoperatorias de cesárea en la Sala de Recuperación del Hospital Siti Khodijah Muhammadiyah Cabang Sepanjang. Los 25 pacientes que componen la muestra de estudio se determinaron mediante la técnica de muestreo consecutivo durante 2 semanas. Proporcionar compresas calientes fue la variable independiente y los grados de escalofríos fueron la variable dependiente. Se colocaron compresas calientes con envase cerrado a una temperatura de 40°C en el brazo derecho e izquierdo del paciente y se dejaron durante unos 15 minutos, seguido de una reevaluación de la temperatura corporal y la determinación del grado de escalofríos en la muestra. El análisis de datos se realizó utilizando la prueba estadística de Wilcoxon Signed Rank.

Resultados: Los resultados mostraron un valor de $p = 0,0001 < \alpha = 0,05$. Esto significa que hay un efecto significativo debido a la administración de compresas calientes en términos de un cambio en la temperatura corporal. También hubo diferencias antes del tratamiento de 1 grado de escalofríos para 20 muestras y 2 grados de escalofríos para 5 muestras. Después de recibir el tratamiento, el grado de escalofríos cambió en 0 para 20 muestras y en 1 grado de escalofríos para 5 muestras.

Conclusión: Este estudio concluyó que la administración de bolsas calientes provocó una reacción en los receptores de la piel y canalizó los efectos de una temperatura hipotalámica a través de la evaporación para reducir el grado de escalofrío.

Palabras clave: Cesárea, compresa caliente, grado de escalofríos

INTRODUCTION

Surgical actions can cause various problems. One of the complications that may arise after surgery is a decrease in the client's body temperature or postoperative hypothermia (1). The process of decreasing body temperature due to surgery will increase the body excess, improve vasoconstriction, and cause changes in the system of thermoregulation in the hypothalamus.

Hypothermic effects can also be corrected and affect the postoperative length of stay (2). Increasing the body temperature must be done immediately because the client's subsequent effects will increase other discomforts such as chills and surgical injuries due to straining the surgical wound (3-5).

The results of the 2013 basic health research (Riskesdas) showed that births with the cesarean method amounted to 9.8 % of the total 49 603 births from 2010 to 2013. The incidence of cesarean section in East Java in 2011 was 3,401 operations out of 170,000 deliveries or around 20 % of all childbirths (6). From the data recorded in the medical record of Hospital Siti Khodijah Muhammadiyah Cabang Sepanjang, as many as 318 clients underwent cesarean section surgery from December 2017 to May 2018. A previous study reported that about 78 % of clients who underwent elective abdominal surgery experienced a decrease in body temperature (7,8). In addition, as indicated by the previous studies, for patients who had kidney stone surgery, 100 % experienced hypothermia (35°C) in the GBPT operating room of Dr. Soetomo General Hospital Surabaya. Shivering events are still often found in conscious recovery rooms. Of the 10 clients who experienced shivering at the Hospital of Muhammadiyah Sidoarjo, after the hot pack therapy was given, 6 clients experienced an increase in temperature and changes in their shivering grade.

Post-Anesthetic Shivering is vascular in relation to the skeletal muscles on the face, jaw, head, body, and extremities. It lasts for more than 15 seconds accompanied by hypothermia and vasodilation (7,9-12). The incidence of shivering after anesthesia for clients undergoing spinal anesthesia is around 40 %-60 % (13). Shivering is caused by the stimulation of the posterior hypothalamus from the dorsomedial portion near the third ventricular wall, known as the primary motor center. Many factors can increase the risk of shivering after anesthesia, including the type of anesthesia, age, the temperature and type of intraoperative fluid treatment, the operating room temperature, and the duration of the operation (14-16). Before the patient experiences shivering, it is necessary to take action to warm up the body in the form of heat therapy given to patients whose temperature

is $\leq 36\text{ }^{\circ}\text{C}$ (17). Hot packs are closed packages that contain a gel at a temperature of $40\text{ }^{\circ}\text{C}$ (10). Hot packs will be applied under the right and left arm for about 15 minutes (18). The use of hot packs has never previously been applied to patients who are shivering in the Recovery Room in the Hospital of Muhammadiyah Sidoarjo. Based on the description above, this study was conducted to determine the effect of hot packs on shivering grade in post-operative cesarean section patients in the Recovery Room of Siti Hospital of Muhammadiyah Sidoarjo.

METHODS

This research method was pre-experimental with a one-group pretest-posttest design. The participants of the study were measured pre-test, given the intervention, and then the post-test was done.

The population in this study consisted of all postoperative cesarean section clients in the Recovery Room of Hospital Muhammadiyah Sidoarjo.

In this study, we used the consecutive sampling technique to select the samples by selecting subjects who met the inclusion criteria included in this study up until a certain period (2 weeks). We gained 30 samples, but 5 samples did not meet the inclusion criteria. A total of 3 samples met the emergency operating criteria and 2 samples had undergone general anesthesia. The total samples taken were 25.

The instruments used in this research were an observation of the shivering grade marked on sheets and the SOP made by researchers. The hot packs were used according to the dictated procedures and the privacy of the respondents was maintained. The tools used were hot compresses as part of the hot pack brand resources and poly green brand digital thermometers. The data were analyzed using Wilcoxon Rank test statistics.

RESULTS

Based on Table 1, it was found that 48 % (12 respondents) were aged 26-35 years old. The education level was senior high school for many as 16 respondents (64 %). Regarding the frequency of work, most of the respondents were

housewives, totaling 14 respondents (56 %). The frequency of the BMI of the respondents was mostly in the category of excess weight (23-29,9) for as many as 19 respondents (76 %). For the history of cesarean section, it was found that most of the respondents had no previous history of caesarean section as many as 14 respondents (56 %). For the length of the operation, the results were mostly >60 minutes for as many as 15 respondents (60 %).

Table 1
Characteristics of the Respondents

Variables (n)	Frequency (%)	Percentage
Age		
17-25 years	8	32
26-35 years	12	48
36-45 years	5	20
Education		
Junior High School	3	12
Senior High School	16	64
Diploma	5	20
Graduates	1	4
Job		
Private	10	40
Entrepreneur	1	4
Housewives	14	56
Body Mass Index (BMI)		
Normal weight (18.5-22.9)	2	8
Excess weight (23-29.9)	19	76
Obesity (30 and above)	4	16
History Cesarean Section		
Yes	11	44
No	14	56
Operating Duration		
60 minutes	10	40
>60 minutes	15	60
Total	25	100

Based on Table 2, for the body temperature of the patients before being given a hot pack, the results were mostly in the temperature range of $35\text{ }^{\circ}\text{C}$ - $35.5\text{ }^{\circ}\text{C}$ for as many as 24 respondents (96 %). After being given a hot pack, the results were mostly in the temperature range of $36.1\text{ }^{\circ}\text{C}$ - $36.5\text{ }^{\circ}\text{C}$ for as many as 16 respondents (64 %). For the shivering grade in the postoperative cesarian patients before being given hot packs, the results show that most had a 1 shivering grade, totaling 20 respondents (80 %). After applying the hot packs, it was found that most of them had a 0 shivering grade, totaling 20 respondents (80 %).

Table 2

Body temperature and shivering grade in post-operative cesarean section patients before-after being given hot packs

Variables	Pre		Post	
	n	%	n	%
Body Temperature				
35 °C-35.5 °C	24	96	1	4
35,6 °C-36 °C	1	4	8	32
36,1 °C-36.5 °C	0	0	16	64
Shivering Grade				
0	0	0	20	80
1	20	80	5	20
2	5	20	0	0
3	0	0	0	0
4	0	0	0	0

Based on Table 3, it can be seen that after the Wilcoxon test was used to find out the effect of the provision of hot packs on shivering grade, the result of asymp sig = 0,0001 $\alpha = 0.05$ means that H₀ is rejected and H₁ is accepted. This means that there is an effect due to the giving of hot packs on shivering grade in post-operative cesarean section patients in the Recovery Room of the Hospital of Muhammadiyah Sidoarjo.

Table 3

Effect of hot pack administration on shivering grade in post-operative cesarean section patients

Knowledge Criteria	Frequency (n)	Percentage (%)	p-value
Negative Rank	25	100	0,0001*
Positive Rank	0	0	
Ties	0	0	
Total	25	100	

* $\alpha < 0.05$

DISCUSSION

Identification of shivering grade before hot pack administration in post-cesarean section surgery patients

Based on the results of the research conducted in the Hospital of Muhammadiyah Sidoarjo, it

was found that the shivering grade before the hot pack was given was grade 1 for 20 respondents. Much of the shivering occurred in the respondents in early adulthood (26-35 years old) for as many as 48 % and in late adulthood (36-45 years old), totaling 20 %.

This is in accordance with the theory which states that the age factor can affect the body's metabolism due to hormones, thus having an indirect effect on body temperature (19). The body's core temperature decreases by 0.003 °C for each increase in age (20). In another study, it was shown that late adults experienced shivering more often than the other age groups (21). Age can affect the occurrence of shivering post-anesthesia, where the shivering threshold at old age is lower than 1 °C. In this study, the researchers argue that the older the age of the patient, the more that the body's core temperature decreases. This is because, past a certain age, there is a decline in metabolism. This means that the ability of the body to maintain its temperature also begins to decrease.

The Body Mass Index results were mostly in the category of excessive body weight / 23-29.9 kg/m² for as many as 19 respondents (76 %). In the study by Vanessa et al. (2009), she explained the presence of morphometric influences including the body weight, height, and body fat of patients in relation to the incidence of hypothermia during surgery. People who are malnourished easily experience a decrease in body temperature (hypothermia). Body temperature is related to a high BMI (Body Mass Index). The greater the BMI, the greater the body temperature (22). Individuals with a thick layer of fat tend not to experience hypothermia because fat is a good enough insulator to channel heat at a speed of one-third of the speed of other tissues (13). According to the theory above, the researcher argues that respondents who have a large BMI have an increased body temperature. This means that the respondents do not readily experience shivering because thick layers of fat can transmit heat.

Based on the length of the operation, all respondents who underwent surgery for > 60 minutes experienced shivering events, totaling 15 respondents (60 %). The above results relate to the theory explaining that there is a relationship between the duration of anesthesia and the onset of hypothermia (23). The longer the duration of

the operation, the lower their body temperature can be, which can trigger shivering. According to a previous study, shivering is a response to hypothermia during surgery in terms of the difference between the temperature of the blood and the skin in contrast with the core temperature of the body (24). Respondents who underwent surgery > 60 minutes experienced shivering quite a lot. This is in line with the research which stated that the incidence of shivering after spinal anesthesia was most prevalent among the respondents who underwent surgery with a duration of 61-120 minutes (25).

The researcher argues that a longer operation will cause post-operative shivering because the skin is exposed to cold temperatures for too long. During spinal anesthesia, it inhibits the release of the hormone catecholamine which suppresses heat production depending on the individual's metabolism. In addition, a long operation and the type of operation have an effect. In a cesarean section, the surgeon carries out incisions in the abdominal wall and uterus, causing an increase in heat output from the body to the external environment which increases the risk of hypothermia. This happens because the respondents are exposed to cold room temperatures for longer and because they are not given blankets to cover their hands, shoulders, and neck during surgery.

The temperature in the operating room in the Hospital of Muhammadiyah Sidoarjo was 18 °C, which can increase the risk of shivering. This is in accordance with the theory which states that operating rooms at a temperature of less than 20 °C can cause a decrease in body temperature (3). Researchers argue that cold temperatures or hypothermia in post-operative cesarean patients cause contractions of the blood vessels that drain food and oxygen from the tissues until the intake is inadequate. A decrease in blood flow also leads to the risk of blood clots forming which further inhibits tissue oxygenation and causes resistance in the healing phase of the operation wound.

Identification of the shivering grade after giving a hot pack

Based on the results of the research conducted in the Hospital of Muhammadiyah Sidoarjo, it

was found that the shivering grade after being given the hot pack was 0 for 20 respondents and 1 for 5 respondents.

The results show that most patients experienced a decrease in shivering grade after the hot packs were applied.

Most respondents experienced a rise in body temperature back to normal (36 °C – 37 °C) and a decrease in shivering grade to 0. This is supported by May (2018) in that the increase in body temperature returned to normal (36 °C-37 °C) after the administration of hot pack heat therapy. This is caused by the effects of heat from the hot packs reacting with the skin receptors that function as a form of body temperature regulation for both heat and cold temperatures (23).

The skin receives heat from the hot packs, the temperature of which is regulated according to the tolerance that the respondent can accept (40 °C) until the heat can spread from the skin area to the blood vessels that cause vasodilation. This helps to repair the body temperature, helping to lessen the rate of shivering so then the body temperature becomes normal.

A total of 5 respondents did not experience a significant increase in body temperature after they were given a hot pack because they had a body mass that was above normal (obesity), were older adults, and because of the length of time spent in the operating room. This is in accordance with the study indicating that body mass affects the return to a normal body temperature (26).

Researchers argue that body mass affects the increase or decrease in body temperature. People who have less body mass, they will quickly experience a decrease in body temperature when exposed to cold or hot temperatures. Heat therapy using hot packs can restore the body temperature quickly, as well as the sensations and effects of heat delivered through the skin and received by the dermal nerves. This results in the dilation of the dermal capillaries, making the blood flow more to the surface of the skin so then it can spread. This causes the temperature of the skin to increase.

Parts of the body that easily absorb and return body heat are the parts that are more sensitive to heat, namely the eyelids, neck, and the inside of the arm or axilla (26).

Based on the results of the above research, researchers argue that the reduction in shivering grade among post-operative cesarean section patients is influenced by several factors, namely the length of the operation or the length of time the patient is exposed to cold air in the operating room, age, body mass index, nutrition, operating room temperature, and blood loss during the surgery. Repeated shivering when in the recovery room can occur because it is influenced by various factors including the recovery room where the temperature is cooler than the operating room and cleaning the patient after the surgery ends. When in the recovery room, the patient's post-operation heat is not immediately replaced by their clothes and blankets. When the patient is taken by the clerk, the new room will be cleaned and replaced.

Analysis of the shivering grade before and after giving hot packs to patients post-cesarean section

Based on the results of the Wilcoxon test analysis, a significance value (p) value of 0.0001 was obtained with a significance level of α 0.005. This means that with the p-value $< \alpha$, thus it can be concluded that H_0 is rejected and H_1 is accepted. This means that there is an effect when giving a hot pack to reduce the shivering grade of patient's post-cesarean surgery in the Recovery Room of the Hospital of Muhammadiyah Sidoarjo.

Stawsky (2015) argues that the increase in body temperature returning it to normal (36 °C-37 °C) after the administration of hot pack heat therapy is caused by the heat effect of the hot packs. They cause a reaction in the skin receptors that function as part of the body's temperature regulation for both hot and cold temperatures (26).

This is related to the theory of the mechanism for increasing the temperature when the body is too cold, where 3 ways can increase the amount of heat (17). When the body is too cold, the temperature regulation system performs the exact opposite procedure, namely skin vasoconstriction throughout the body. This is caused by the stimulation of the posterior hypothalamic sympathetic center. Piloerection i.e., sympathetic stimulation causes the erector pili muscles attached to the hair follicles to contract so then the hair stands upright and increases the rate of thermogenesis (formation of heat). This is the formation of heat via an increased metabolic

system that triggers the occurrence of shivering, followed by sympathetic stimulation for the formation of heat and secretion of thyroxine.

The hypothalamic stimulation origin of shivering is located in the dorsomedial part of the posterior hypothalamus near the third ventricular wall. This is an area called the primary motor center for shivering. The effect of hypothalamic temperature on body heat dissipation through evaporation and heat formation is mainly caused by muscle activity and shivering (17).

If the body becomes too cold, signals from the skin and the inner body receptors give off an uncomfortable cold feeling. Therefore, individuals will adjust the environment to be able to reach a more comfortable point such as moving into a hot room or wearing clothes that have good insulation against cold air. This is a system of bodily regulation that is stronger than those found by physiologists in the past. This mechanism is an effective mechanism for maintaining body temperature in very cold environments (17).

This is supported by the previous research on the effectiveness of hot packs when it comes to decreasing the body temperature in the first 10 minutes after experiencing a normal temperature increase (36 °C-37 °C) (24).

Based on the results of the above research, researchers argue that there is an effect due to giving a hot pack in relation to the shivering grade through the mechanism used to increase body temperature. The giving of heat therapy means that the effect of hypothalamic temperature on body heat dissipation through evaporation is disrupted. Evaporation is a process that requires heat (evaporation heat) which is absorbed through the skin. This invisible evaporation from the skin or lungs cannot be controlled to regulate temperature because the evaporation results from the continuous diffusion of water molecules through the surface of the skin and respiratory system.

LIMITATIONS

This study had several limitations such as door space, where the semi-public recovery rooms were often open, affecting the measurement. The giving of the hot pack within 15 minutes,

when used in this research, showed that not all respondents showed a significant increase. Over a longer period of use, the hot packs will decrease in temperature. The sampling used in this study should have been random sampling so then the results can be generalized.

CONCLUSION

In conclusion, most of the respondents, before being given a hot pack, had a 1-point shivering grade, totaling 80 % of respondents. Most of the respondents after being given a hot- pack had a grade of 0, totaling 80 % of respondents. It is due to the effect of giving a hot pack on shivering grade in post-operative cesarean patients in the Recovery Room of Hospital Muhammadiyah Cabang Sepanjang.

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