



## Factors that Influence the Occurrence of Hypothermia in Patients Undergoing Spinal Anesthesia at IBS RSI Fatimah Cilacap

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### ABSTRACT

*Spinal anesthesia is a method of anesthesia in which local analgesics are injected into the subarachnoid space of the lower back. Hypothermia can also be defined as an internal body temperature below 36°C. The incidence of postoperative hypothermia has been reported to be 8-90%. The purpose of this study was to determine the factors that influence the incidence of hypothermia in spinal anesthesia patients at IBS RSI Fatimah Cilacap. This research method uses quantitative analytical observation with total sampling technique. The population in this study were spinal anesthesia patients with hypothermia with a sample of 37 respondents. The results showed that the most dominant age of respondents was adult 25-46 years (45.9%) with mild hypothermia (29.7%), female gender (59.5%) with the same incidence of mild and moderate hypothermia (29.7%), normal BMI (64.9%) with mild hypothermia (37.8%), and moderate length of surgery 1-2 hours (56.8%) with mild hypothermia (32.4%). The conclusion of this study is that the factor that most influences the incidence of hypothermia is BMI, namely with normal BMI as much as (64.9%) with the incidence of mild hypothermia 32.4%.*

**Keywords :** *Anesthesia Spinal, Hypothermia, Body Temperature, Body Mass Index (BMI)*

### 1. INTRODUCTION

A reliable, straightforward, and the most commonly practiced anesthesia technique worldwide is spinal anesthesia. However, side effects such as hypotension, bradycardia, and temperature control are often associated with spinal anesthesia (Tatikonda et al., 2019).

Spinal anesthesia is an anesthesia method in which a local analgesic is injected into the subarachnoid space in the lower back. By introducing local anesthesia into the subarachnoid space at the lumbar level (typically L4 and L5), a comprehensive nerve block known as spinal anesthesia is achieved. This method provides anesthesia to the

perineum, lower abdomen, and lower extremities (Fitria et al., 2019).

Complications with a high risk of occurrence occur during the post-anesthesia recovery period. It is reported that patients experience complications after undergoing anesthesia at a rate of 2.5%. Hypothermia is one of the causes of these occurrences, resulting from both anesthesia and surgery (Fitrianingsih et al., 2021). The incidence of postoperative hypothermia has been reported to be 8-90%, depending on the type of surgery, anesthesia method, patient age, the definition of hypothermia, the measurement location, and the type of thermometer used (Cho et al., 2021). More than 80% of surgeries use regional anesthesia rather than general anesthesia.



Spinal anesthesia, which involves injecting a local anesthetic into the subarachnoid space, is useful for lower limb and abdominal surgeries. Anesthesia has three phases: pre-, intra-, and post-operative (Mendonça et al., 2019).

Hypothermia can also be defined as an internal body temperature below 36°C (Afsari & Lestari, 2019). The normal human body temperature ranges between 36.5°C - 37.7°C. Factors influencing the occurrence of hypothermia include age, gender, Body Mass Index (BMI), duration of surgery, fluid intake, room temperature, type of surgery, extent of surgery, and anesthetic drugs.

The occurrence of hypothermia during spinal anesthesia is not triggered by sensitivity to cold. This describes an event where the subjective perception of cold depends on afferent input of skin temperature and peripheral vasodilation caused by the effects of spinal anesthesia. After the redistribution of body heat to the periphery during the induction of general and spinal anesthesia, hypothermia depends on the balance between heat loss at the skin and the heat metabolism that will release body heat.

In a study conducted by (Cho et al., 2021) on patients undergoing general anesthesia or neuraxial anesthesia (spinal), female gender, older age, low body mass index, low preoperative body temperature, low operating room temperature, major surgery, longer duration of surgery, intravenous fluid volume, high-level neuraxial anesthesia, and anesthesia technique were associated with the occurrence of hypothermia.

Based on the preliminary study at IBS RSI Fatimah Cilacap, the number of patients on November 11, 2022, showed an increase in the number of patients undergoing surgery each month. A total of 958 patients underwent surgical procedures during the period from October to December. According to the data obtained, it was found that approximately 497 individuals undergoing surgical procedures chose to use spinal anesthesia. Recorded cases of hypothermia in patients undergoing spinal anesthesia at RSI Fatimah Cilacap ranged from 25% to 90%.

Temperature monitoring becomes important when there are substantial intentional, predicted, or expected changes in body temperature. One of the most common problems encountered is hypothermia, a condition that occurs due to the loss of radiative heat. Several techniques are used to maintain normothermia, such as providing a warm environment, using warming lamps, or administering intravenous fluids (KEMENKES RI, 2022).

The objective of this research is to determine the factors that influence the occurrence of hypothermia in patients undergoing spinal anesthesia at IBS RSI Fatimah Cilacap.

## 2. RESEARCH METHOD

This research employs an analytical observational quantitative approach to investigate the occurrence of hypothermia in patients undergoing spinal anesthesia at the Central Surgery Department of the Islamic Hospital Fatimah Cilacap. The study population consists of patients who have undergone spinal anesthesia and experienced hypothermia, totaling 37 respondents. The sample selection in this study utilizes a Total Sampling technique, with the following criteria:

### a. Inclusion Criteria

- 1) Willing to participate as respondents (17 to 65 years old)
- 2) Patients who underwent spinal anesthesia and experienced hypothermia

### b. Exclusion Criteria

- 1) Patients with a decreased level of consciousness
- 2) Patients with psychiatric disorders
- 3) Patients who did not experience hypothermia

This research employs observation sheets as the data collection instrument. Data collection methods used in this study include both primary and secondary data sources. Specifically, primary data is collected by directly asking for respondents' names and measuring their body temperature directly using a thermogun. Secondary data refers to the use of existing patient information, particularly

related to variables such as weight, height, and age, as documented in the respondents' medical records.

Data collection is carried out by the researcher, who measures the body temperature of patients using a thermogun after the spinal anesthesia procedure. The results are recorded and documented by the researcher on the observation sheets, which must be included in the observation sheets. The researcher has obtained ethical approval from the Research Ethics Committee of Harapan Bangsa University with reference number No. B.LPPM-UHB/1770/05/2023. Data analysis employed in this research includes univariate analysis, which is presented descriptively using data collection sheets or observation sheets that contain names, age, gender, weight, height, BMI, duration of surgery, and patient body temperature. After data collection, the next step is data management. Data processing is done using IBM SPSS Statistics 26.

### 3. RESULT AND DISCUSSION

#### 3.1 Research Results

**Table 4.1** Cross-tabulation between Age and Hypothermia in patients undergoing Spinal Anesthesia at IBS RSI Fatimah Cilacap in June 2023 (n=37)

Age	Hypothermia					
	Mild 34-35,9		Moderate 32-33,9		Total	
	f	%	f	%	f	%
Teenagers (17-25 years)	2	5,4	4	10,8	6	16,2
Adults (26-45 years)	11	29,7	6	16,2	17	45,9
Eldery (46-55 years)	5	13,5	5	13,5	10	27,0
Late Eldery (56-65 years)	0	0,0	1	2,7	11	2,7
Seniors (> 65 years)	1	2,7	2	5,4	3	8,1
<b>Total</b>	19	51,4	18	48,6	37	100

Based on Table 4.1, the respondents who experienced hypothermia the most were in the 26-45 age group (adults), with a total of 17 individuals (45.9%). Out of these 17 respondents, 11 individuals (29.7%)

experienced mild hypothermia, and 6 individuals (16.2%) experienced moderate hypothermia.

**Table 4.2** Cross-tabulation between Gender and Hypothermia in patients undergoing Spinal Anesthesia at IBS RSI Fatimah Cilacap (n=37)

Gender	Hypothermia					
	Mild 34-35,9		Moderate 32-33,9		Total	
	f	%	f	%	f	%
Male	8	21,6	7	18,9	15	40,5
Female	11	29,7	11	29,7	22	59,5
<b>Total</b>	19	51,4	18	48,6	37	100

According to Table 4.2, female respondents experienced hypothermia more frequently than male respondents, with a total of 22 individuals (59.5%). The occurrence of mild and moderate hypothermia in females was the same, with 11 individuals (29.7%) for each category.

**Table 4.3** Cross-tabulation between Body Mass Index (BMI) and Hypothermia in patients undergoing Spinal Anesthesia at IBS RSI Cilacap (n=37)

BMI	Hypothermia					
	Mild 34-35,9		Moderate 32-33,9		Total	
	f	%	f	%	f	%
Very Underweight (< 17,0)	0	0,0	2	5,4	2	5,4
Underweight (17,0 - 18,4)	1	2,7	6	16,2	7	18,9
Normal (18,5 - 25,0)	14	37,8	10	27,0	24	64,9
Overweight (25,1 - 27,0)	3	8,1	0	0,0	3	8,1
Very Overweight (> 27,0)	1	2,7	0	0,0	1	2,7
<b>Total</b>	19	51,4	18	48,6	37	100

According to Table 4.3, mild hypothermia occurred more frequently in the normal BMI category, with a total of 24 individuals (64.9%). Respondents who

experienced mild hypothermia numbered 14 individuals (37.8%), while those with moderate hypothermia were 10 individuals (27.0%). However, in the underweight BMI category, 6 individuals (16.2%) experienced moderate hypothermia.

**Tabel 4.4** Cross-tabulation between Duration of Surgery and Hypothermia in patients undergoing Spinal Anesthesia at IBS RSI Fatimah Cilacap (n=37)

Duration of Surgery	Hypothermia				Total	
	Mild 34-35,9		Moderate 32-33,9		f	%
	f	%	f	%		
< 1 Hour	2	5,4	0	0,0	2	5,4
1-2 Hours	12	32,4	9	24,3	21	56,8
> 2 Hours	5	13,5	9	24,3	14	37,8
<b>Total</b>	<b>19</b>	<b>51,4</b>	<b>18</b>	<b>48,6</b>	<b>37</b>	<b>100</b>

According to Table 4.4, hypothermia occurred more frequently in respondents with a surgery duration of 1-2 hours, totaling 21 individuals (56.8%). Out of these 21 respondents, 12 individuals (32.4%) experienced mild hypothermia. Moderate hypothermia occurred in respondents with a surgery duration of 1-2 hours, 9 individuals (24.3%), as well as in those with a surgery duration of >2 hours, 9 individuals (24.3%).

### 3.2 Discussion

Factors of Hypothermia Incidence Based on Age in Patients Undergoing Spinal Anesthesia at the Central Surgery Department of Islamic Hospital Fatimah Cilacap

In this study, the researcher combined the characteristics of early and late adults into one category because they both fall into the adult age group. Therefore, the researcher grouped them with teenagers, adults, the elderly, and seniors to simplify the results. The largest group of respondents at RSI Fatimah Cilacap was the adult age group, comprising 17 individuals (45.9%), and the highest incidence of mild hypothermia was found among respondents in the 26-45 age range, totaling 11 individuals (29.7%). Based on this research, individuals aged 26-45 years were also

susceptible to experiencing hypothermia. This finding contrasts with a study by (Pringgayuda et al., 2020) which reported that respondents aged >46 years (the elderly) experienced hypothermia in 19 cases (86.4%). This is supported by (Widiyono et al., 2020) who found a positive correlation between respondent age and the likelihood of experiencing hypothermia. Out of the total sample, 18 individuals (34.0%) were classified as elderly. However, the proportion of hypothermia between elderly and adult respondents differed. Therefore, elderly patients fall into the extreme age group and are at higher risk of experiencing hypothermia during the perioperative period. Spinal anesthesia in elderly patients can alter the threshold of thermoregulation more than in younger patients.

In the theory proposed by (Mendonça et al., 2019) it is also stated that compared to younger patients, elderly patients have lower temperatures and a longer delay in hypothermia regression. The literature indicates that perioperative hypothermia is more common and lasts longer in this age group.

Factors of Hypothermia Incidence Based on Gender in Patients Undergoing Spinal Anesthesia at the Central Surgery Department of Islamic Hospital Fatimah Cilacap

The majority of respondents in this study were females. The results of this research indicate that female respondents are more likely to experience hypothermia compared to males, with a total of 22 individuals (59.5%). Among them, 11 individuals (29.7%) experienced mild hypothermia, while 11 individuals (29.7%) experienced moderate hypothermia. These findings are consistent with those of (Widiyono et al., 2020) which reported a higher incidence of hypothermia in females compared to males, at 52.8%. The research results show that women are more susceptible to hypothermia compared to men. Unlike men, women are more susceptible to diseases and complications due to biological and physiological differences that cannot be interchanged. This study also aligns with (Caniago, 2022) where the majority of patients were female, totaling 24 individuals (54.5%). According to the research, women are more susceptible to hypothermia than men. Body weight plays a role in hypothermia. Their



bodies contain more fat compared to obese individuals. Young adult men have more than 25% body fat, while women have more than 35%. The distribution of body fat based on gender is also different: men tend to experience abdominal obesity more than women, which is why men are less likely to suffer from hypothermia (Widiyono et al., 2020).

Women are more susceptible to diseases and complications compared to men. All of this is due to the biological and physiological differences between women and men that cannot be interchanged (Fitriani et al., 2022).

Factors of Hypothermia Incidence Based on Body Mass Index (BMI) in Patients Undergoing Spinal Anesthesia at the Central Surgery Department of Islamic Hospital Fatimah Cilacap

The results of this study show that respondents with mild and moderate hypothermia fall into the normal BMI category, totaling 24 individuals (64.9%). Among them, 14 individuals (37.8%) experienced mild hypothermia, and 10 individuals (27.0%) experienced moderate hypothermia. This study is consistent with the research conducted by (Pringgayuda et al., 2020) Out of the total sample, the majority of patients, 21 individuals (77.8%), experienced hypothermia and had a BMI below 25.0. The statistical test resulted in a p-value of 0.021, which is smaller than the predetermined significance level ( $\alpha = 0.05$ ). This indicates that the null hypothesis ( $H_0$ ) can be rejected, leading to the conclusion that there is a significant relationship between Body Mass Index (BMI) and the incidence of hypothermia. This research is also supported by (Muntaha et al., 2022) The majority of respondents (39, 40.6%) had a normal BMI, with a p-value of 0.000 ( $p < 0.05$ ), indicating a relationship between BMI and hypothermia in patients after spinal anesthesia surgery.

According to the study by (Tubalawony & Siahaya, 2023) BMI is related to hypothermia in patients because the metabolism of each individual varies, influenced by their height and weight. Therefore, the metabolism process of each individual is different, and one of the

consequences of this metabolism process is the thermoregulation system, including hypothermia and hyperthermia. Individuals with a low BMI have fewer fat reserves and, as a result, cannot retain heat in their bodies. This is because spinal anesthesia affects three elements of thermoregulation, including afferent input elements, modulation of signals in the central region, and efferent responses. Spinal anesthesia also disrupts the adaptation process, interfering with the physiological mechanisms of fat/skin in thermoregulatory function, altering the threshold response to vasoconstriction, tremors, vasodilation, and sweating.

Therefore, the researcher assumes that every person has a different BMI. In this study, it was found that patients with a normal BMI had the highest incidence of hypothermia. However, patients with a BMI below <18.0 were also more susceptible to experiencing shivering or hypothermia due to their thin fat layer, whereas those with normal and overweight BMI were better at regulating body temperature.

Factors of Hypothermia Incidence Based on Duration of Surgery in Patients Undergoing Spinal Anesthesia at the Central Surgery Department of Islamic Hospital Fatimah Cilacap

The results of this study show that respondents undergoing surgery with a duration of 1-2 hours were more numerous and also had a higher incidence of hypothermia, with a total of 21 individuals (56.8%). Respondents who experienced mild hypothermia during a 1-2 hour surgery duration were 12 individuals (32.4%). However, respondents who experienced moderate hypothermia were equally distributed between those with a 1-2 hour surgery duration and those with a duration of >2 hours, with 9 individuals in each group (24.3%).

This study aligns with (Caniago, 2022) as the research results indicate that up to 22 patients (50.0%) underwent surgery lasting 1-2 hours. In the study by (Nurmansah et al., 2021) it was shown that the majority (60%) of respondents with moderate duration underwent surgeries that lasted between one to two hours.

The effects of post-spinal anesthesia are explained by (Mashitoh et al., 2018) because spinal anesthesia blocks sympathetic responses, muscle relaxation, and peripheral sensory temperature receptor blocks, thereby inhibiting temperature compensation. Consequently, vasoconstriction is reduced, leading to shivering and hypothermia as potential outcomes. Factors such as room temperature, surgery duration, surgery type, hydration, intravenous fluids, and anesthesia serve as triggers (Syau et al., 2020).

In the theory proposed by (Liu & Qi, 2021) in short, being over 60 years of age, intraoperative infusion volume >1500 ml, intraoperative blood loss >300 ml, major surgery, and surgery duration >2 hours are risk factors for hypothermia in PACU patients. Generally, this occurs in moderate or major surgeries that last longer than 1 hour (60 minutes).

The operating room temperature at RSI Fatimah Cilacap is maintained at 20°C-22°C. Prolonged exposure of patients to lower room temperatures (<26.6°C) results in a drop in their body temperature. Therefore, patients undergoing surgical procedures and anesthesia for extended periods will experience sustained heat loss and are at a higher risk of developing hypothermia. In this study, patients with short, moderate, and long surgery durations are susceptible to hypothermia due to other factors like room temperature and fluid levels. Consequently, the longer the surgery, the higher the likelihood of post-spinal anesthesia hypothermia.

## CONCLUSION

Based on the research results and discussion above, it can be concluded that the most influential factor in this study is a normal Body Mass Index (BMI) with a percentage of 64.9%, where mild hypothermia occurred in 14 individuals (37.8%).

Hypothermia incidence based on age is most prominent in the 26-45 age group, with 17 individuals (45.9%), of whom 11 individuals (29.7%) experienced mild hypothermia. Hypothermia incidence based on gender shows a higher prevalence in female respondents compared to males, with 22 individuals

(59.5%). Among them, 11 individuals (29.7%) experienced mild hypothermia, while another 11 individuals (29.7%) experienced moderate hypothermia.

The factor of surgery duration regarding hypothermia incidence in spinal anesthesia patients at RSI Fatimah Cilacap reveals that respondents with a 1-2 hour surgery duration are the most susceptible, totaling 21 individuals (56.8%). Of these, 12 individuals (32.4%) experienced mild hypothermia.

## RECOMMENDATION

For RSI Fatimah Cilacap:

It is recommended for RSI Fatimah Cilacap to provide fluid infusion warmers and blanket warmers to reduce the risk of hypothermia. This will help in maintaining the patients' body temperature during spinal anesthesia procedures.

Anesthesia practitioners should further explore the factors influencing hypothermia and be vigilant regarding patients at risk of hypothermia by regularly monitoring and recording patient body temperatures.

For Universitas Harapan Bangsa:

Universitas Harapan Bangsa is encouraged to offer more comprehensive theory and references related to anesthesia, particularly complications such as hypothermia in spinal anesthesia. This will enhance students' understanding of the factors influencing hypothermia and enable them to implement strategies to prevent its occurrence.

For Future Researchers:

Future researchers should consider expanding their study by delving into the various factors contributing to hypothermia in patients undergoing spinal anesthesia. This can be achieved through a thorough review of relevant articles and journals on anesthesia complications.

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