



## A Cross-Sectional Study on the Relationship Between Age and Duration of Surgery and the Incidence of Post-Anesthesia Hypothermia

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### ABSTRACT

*Background: Hypothermia is a post-anesthesia complication commonly found in the recovery room after general and regional anesthesia. Patients undergoing surgery are at risk of hypothermia. Hypothermia can be defined as a body temperature of less than 36°C. Objective: to identify the relationship between age and length of surgery with the incidence of post-anesthesia hypothermia at RSUD Dr. R. Goeteng Taroenadibrata. Methods: This research method uses a quantitative approach with a cross-sectional approach. A sample of 86 post-anesthesia respondents with a purposive sampling technique and chi-square test to analyze the data. Results: This study shows a relationship between age and the incidence of hypothermia with a chi-square value with a probability value of  $0.001 < 0.05$ . This study also showed relationship between the length of surgery and the incidence of hypothermia with a  $p$  value = 0.001. Conclusion: This shows a relationship between age and length of surgery and post-anesthesia hypothermia incidence at, Regional public hospital dr. R. Goeteng Taroenadibrata Purbalingga.*

**Keywords:** Hypothermia, Length of Surgery, Age, Post-anesthesia

### 1. INTRODUCTION

Hypothermia is a prevalent post-anesthesia complication in the recovery room following general and regional anesthesia. Hypothermia is characterized by a core temperature of 1°C below the average core temperature of the human body at repose in normal environmental temperature. If nothing is done, one in three patients will develop hypothermia during surgery. Approximately 30% to 40% of post-anesthesia patients with hypothermia appear in the recovery room (Harahap, Kadarsah, and Oktaliansah 2014)

Anesthesia administration and surgical procedures are two of the effects of hypothermia. One of the effects of hypothermia is administering anesthesia and performing surgery. The postoperative incidence rate of 14-15% in Western nations indicates a daily increase in surgical procedures. While in

Ethiopia and Kenya, a cohort study revealed a 95 percent increase (Ndebea et al. 2020). According to data from the Ministry of Health, surgery ranks eleventh out of fifty disease treatments in Indonesia, and the estimated percentage of patients undergoing surgery in 2019 was 12.8%. According to research conducted by the Ministry of Health, numerous surgical procedures are performed in Indonesia. This factor also influences the incidence of post-anesthesia complications, including hypothermia (Depkes 2019). In the aftermath of elective surgery, 26% to 90% of patients suffering from hypothermia, or a body temperature below 36°C. Patients over 60 with malnutrition and diseases that affect abnormal thermoregulation, such as diabetes mellitus with polyneuropathy, and patients undergoing extensive or protracted surgery, are especially susceptible to hypothermia. (Siswoyo, Imam S, and Siyoto 2020)

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According to research conducted by (Mubarakah 2017), the prevalence of hypothermia increased with the age of the respondents; compared to younger patients, the elderly were more susceptible to hypothermia. The thermoregulatory thresholds of elderly patients can be substantially altered by spinal anesthesia. Major surgery (>60 minutes) increased the likelihood of hypothermic events among respondents. This is to the theory that shivering is the body's mechanism for maintaining internal, blood, and skin temperature during surgery (Widiyono, Suryani, and Setiyajati 2020)

According to the author's survey results, 115 (41%) of 276 postoperative patients experienced hypothermia in October. The authors were interested in examining "The relationship between age and length of surgery and the incidence of post-anesthesia hypothermia at Regional public hospital dr. R.Goeteng Taroendibrata " based on the theory and results of their preliminary survey". The author wants to know if there is a relationship between age and length of surgery with the incidence of hypothermia with the aim of identifying the relationship between age and the incidence of post-anesthesia hypothermia and identifying the relationship between the length of surgery with the incidence of hypothermia.

## 2. RESEARCH METHODS

This study utilized quantitative observational research for analysis. Analytic observational quantitative research involves observing a phenomenon between risk factors and effect factors and then conducting an analysis to determine the degree to which a factor contributes to the occurrence of a specific event (Notoatmodjo 2018). This study employs a cross-sectional design, which uses a point-in-time approach (observation or data collection at one time) to investigate the dynamics of the correlation between risk factors and effects. the sample in this study were all patients who underwent surgery using anesthesia at Regional public hospital dr. R.Goeteng Taroendibrata, determining the sample this time using purposive sampling technique, the sample size in this study was 86 samples which were determined using the Slovin formula and using an axil thermometer as a tool to measure body temperature.

This research subject is observed only once, while variables with effects are observed concurrently (Notoatmodjo 2018). Using analytical observational research, which begins with data collection and ends with data analysis, the type of data in this study uses primary and secondary data, with data collection techniques, namely direct observation with data analysis using univariate and bivariate, researchers are expected to be able to systematically explain the results of their research based on facts and data collected from the field or research site. This research was conducted at. Regional public hospital dr. R.Goeteng Taroendibrata Purbalingga on 28 March - 06 April 2023. The Ethics Committee of Harapan Bangsa University approved this investigation under the number B.LPPM-UHB/1513/02/2023.

## 3. RESULTS AND DISCUSSION

### 3.1 Univariate Test Results

**Tabel 4.1 identifies the frequency distribution based on respondent age**

Variable	f	(%)
<b>Age</b>		
17-25 years (Late teens)	17	19.8
26-35 (Early adulthood)	16	18.6
36-45 (Late adulthood)	11	12.8
46-55 (Early elderly)	18	20.9
56-65 (Late elderly)	24	27.9
<b>Total</b>	<b>86</b>	<b>100</b>

The data indicates that 86 respondents were observed, with most of the data showing 24 respondents (27.9%) were elderly. While patients with late maturity comprised a minor proportion, as many as 11 respondents (12.8%) were included in Table 4.1.

**Tabel 4.2 Frequency distribution based on the duration of surgery (n=86)**

Variable	f	(%)
<b>Operation Length</b>		
Fast (< 1 hour)	61	70,9
Moderete (1 – 2 hours)	20	23,3
Long (> 2 hours)	5	5,8
<b>Total</b>	<b>86</b>	<b>100</b>

Seventy point nine percent (61 of 86) of respondents indicated that the duration of surgery with quick time was the most critical factor. Therefore, we confirmed that the extended period accounted for a minor proportion of five respondents (5.8%), as shown in Table 4.2.

**Table 4.3 Identifying Frequency Distribution by type of anesthesia (n=86)**

Variable	f	(%)
<b>Type Anesthesia</b>		
General Anesthesia	45	52.3
Regional Anesthesia	41	47.7
<b>Total</b>	<b>86</b>	<b>100</b>

Analysis based on the type of anesthesia revealed that 52.3% of respondents had received general anesthesia on 45 patients. As shown in Table 4.3, regional anesthesia accounted for a minor proportion of respondents, with only 41 (47.7%).

**Table 4.4 Identifying Frequency Distribution based on the Incidence of Hypothermia (n=86)**

Variable	f	(%)
<b>Hypothermia</b>		
Not hypothermic $\geq 36^{\circ}\text{C}$	45	52.3
Hypothermia $< 36^{\circ}\text{C}$	41	47.7
<b>Total</b>	<b>86</b>	<b>100</b>

The analysis of 86 respondents revealed that 52.3% did not experience hypothermia among 45 respondents. While the proportion of respondents who experienced hypothermia was lower, 41 respondents (47.7%), as shown in Table 4.4, were affected by the condition.

Based on table 4.1 the results of this study found that of the 86 respondents, the age of the elderly dominated with 24 respondents (27.9%) in this study because elderly patients are more susceptible to disease. This is supported by the theory of (Andriani and Wirjatmadi 2012), limited regeneration ability and decreased defense against infection make the elderly more vulnerable to various health problems compared to other adults. This can influence the number of surgeries performed on the elderly.

Based on the descriptive frequency analysis in table 4.2 on the respondents, the data obtained that of the 86 respondents observed, 61 respondents were obtained with fast surgery, this figure shows that the fast duration is the highest number compared to the duration of other operations. This is in line with research conducted (Rini et al. 2022), on the relationship between age and length of surgery with the incidence of hypothermia after general anesthesia based on the study obtained 114 respondents with the largest proportion of respondents with a duration of surgery  $< 1$  hour, namely 70 respondents (61.4%).

Based on descriptive analysis of frequency in table 4.3, the frequency distribution results show that of the 86 respondents observed, 45 respondents (52.3%) were found with general anesthesia, because it was seen from the surgery performed on the upper extremities or seen from the patient's condition that did not allow regional anesthesia to be performed.

### 3.2 Bivariate Test Results

**Table 4.5 Analysis of the Relationship Between Age and the Occurrence of Hypothermia Following Anesthesia (n=86)**

Variable	Hypothermia	(%)	Not Hypothermia	(%)	p
<b>Age</b>					
17- 25 years	3	3,4	14	16,2	0.001
26-35 years	4	4,6	12	14	
36-45 years	2	2,3	9	10,4	
46-55 years	11	12,8	7	8,1	
56-65 years	21	24,4	3	3,8	
<b>Total</b>	<b>41</b>	<b>47.5</b>	<b>45</b>	<b>52.5</b>	

\*significant  $p < 0.05$

\*Bivariate test use  $X^2 = \text{Chi-square test}$

\*SPSS version 24.

The chi-square test reveals a probability value of 0.001 (p-value 0.05), so  $H_a$  is accepted, and  $H_o$  is rejected, indicating a significant association between age and the incidence of post-anesthesia hypothermia. In this study, 52.5% of respondents did not experience hypothermia, with the maximum proportion occurring in late adolescence, where 16.2% of respondents did not experience hypothermia. As shown in Table 4.5,

hypothermia was encountered by 41 (47.5%) of the respondents, with the highest proportion occurring in the oldest age group with an age range of 56-65 years, namely 21 people (24.4%).

**Table 4.6: Analysis of the Relationship Between Length of Surgery and Occurrence of Hypothermia After Anesthesia (n=86)**

Variable	Hypothermia (%)	Not Hypothermia (%)
<b>Age</b>		
Fast (<1 hour)	19 (22.2)	42 (48.8)
Moderate (1-2 hours)	17 (19.8)	3 (3.5)
Long (>2 hours)	5 (5.8)	0 (0)
<b>Total</b>	<b>41 (47.7)</b>	<b>45 (52.3)</b>

\*significant  $p < 0.05$

\*Bivariate test use  $X^2 = \text{Chi-square test}$

\*SPSS version 24.

The chi-square value analysis reveals a probability of 0.001 (p-value 0.05), so  $H_a$  is accepted, and  $H_o$  is rejected, indicating a significant relationship between the length of surgery and the incidence of post-anesthesia hypothermia. Thus, the results of the analysis of patients who underwent surgery with a rapid duration and did not experience hypothermia were 42 patients (48.8%). As shown in Table 4.6, the number of patients who experienced hypothermia during rapid surgery was 19 patients (22.2%) while patients who experienced hypothermia during moderate surgery were 17 patients (19.8) and patients who experienced hypothermia with a long duration of surgery were 5 patients (5.8%).

### 3.3 Relationship between age and Hypothermia

The chi-square test in this study yielded a significant p-value of 0.001, according to Table 4.5. (0.001 0.05) indicates that  $H_a$  is accepted while  $H_o$  is rejected. At Regional public hospital dr. R.Goeteng Tarondibrata, there is thus a correlation between age and post-anaesthesia hypothermia. According to the findings of this study, the older the respondent, the greater the risk of hypothermia. Older people are included in the age category prone to hypothermia after anaesthesia.

This is supported by the theory of (Harahap, Kadarsah, and Oktaliansah 2014), which states that the elderly pose the greatest

risk of developing bradycardia during surgery. This is due to the inability of elderly patients to maintain body temperature after anesthesia, presumably as a result of age-related vasoconstriction changes. Since enzymes that regulate organ function and drug duration are extremely sensitive to changes in temperature, perioperative hypothermia will impact the metabolism of various anesthetic drugs. Increased solubility of anesthetic drugs in plasma will result in a greater equilibrium distribution of drugs throughout the body. The average length of stay in the recovery chamber is lengthened for hypothermic patients. Younger patients have better body temperature maintenance and a smaller thermoregulation threshold shift despite a decrease in thermoregulatory vasoconstriction, allowing them to maintain a normal body temperature for longer than elderly patients.

The findings of this investigation align with previous research (Widiyono *et al.* 2020). According to the study, late elderly patients are prone to post-anaesthesia hypothermia, as evidenced by data processing results, namely the calculated chi-square value of 7.17 with a probability value of 0.028 (p-value 0.05), so  $H_a$  is accepted.  $H_o$  is rejected, indicating a significant relationship between age and the incidence of post-anaesthesia hypothermia.

This study is supported by research (Mubarokah, 2017) indicating that the risk of hypothermia increases with the respondent's age. Older age is a particularly high risk for hypothermia compared to younger ages. This is because senior respondents have a greater shift in thermoregulation threshold than younger individuals. Older people are more susceptible to hypothermia than late adolescents because they cannot sustain normal body temperature, which is controlled by the thermoregulation system and vasoconstriction.

### 3.4 Relationship between Length of Operation and Hypothermia

According to Table 4.6, The correlation or relationship test conducted between the length of surgery and post-anaesthesia hypothermia using the chi-square test yielded a p-value of 0.001, which is statistically significant. (0.001 0.05) is known, so the hypothesis is accepted. At Dr R. Goeteng Tarondibrata Hospital, there is a correlation between the duration of surgery and post-



anaesthesia hypothermia; due to the prevalence of patients undergoing minor surgery at Dr.R. Goeteng Taroenadibrata Hospital, operations with a short course predominate in this study. Sixty-one respondents were diagnosed with abscesses, curettage, debridement, and cast repositioning out of 86 who underwent minor surgery. In this research, the duration of surgery with a short time constitutes the largest proportion. The standard chamber temperature at RSUD Dr R. Goeteng Taroenadibrata is between 19 and 24 degrees Celsius (Permenkes RI 2004).

This study is consistent with the theory (Burhan et al. 2021; Steelman et al. 2017) that Anesthetic drugs with higher concentrations in blood and tissues (especially fat), greater solubility, and extended duration of anaesthesia have a great deal of potential to influence the time of surgery and anaesthesia. Therefore, these agents must seek equilibrium with these tissues. Vasodilation caused by the induction of anaesthesia causes the body to lose heat continually. The body generates heat continuously owing to metabolism. The body regulates heat production and expenditure within 36-37.5°C, whereas immediate surgery requires a smaller anaesthetic dose. Therefore, anaesthetic drugs are more soluble, have a shorter duration of anaesthesia, and have lower concentrations in the blood and tissues (particularly fat), allowing them to achieve equilibrium with the tissues faster. This decreases the risk of hypothermia during brief surgical procedures. Therefore, it can be concluded that patients undergoing surgery and anaesthesia for an extended period will experience continuous heat loss and have an increased risk of hypothermia.

This study's findings are consistent with the research (Pringgayuda, -, and Putra 2020), on the factors associated with hypothermia in patients following general anaesthesia. Statistical tests yielded a p-value of 0.011 (0.05), which indicates an increased risk of hypothermia owing to the duration of the surgical procedure. Patients exposed to frigid temperatures can experience significant heat loss through various processes and mechanisms of heat release (Maulana 2018). This relates to the duration of the surgical procedure. As the surgery progresses, the body's metabolism will decelerate, generating less heat. Consequently,

the patient's hypothermia will rapidly progress (Suanda 2014).

## CONCLUSION

The outcomes demonstrated that general anaesthesia and regional anaesthesia can relationship the thermoregulatory system of the patient. In the bivariate analysis, it was determined that there was a significant correlation between age and the incidence of hypothermia, with a p-value of 0.001 indicating this. In addition, the analysis revealed a significant  $p = 0.001$  correlation between length of operation and the incidence of post-anaesthesia hypothermia. Consequently, we confirmed that age and duration of surgery significantly impact the thermoregulation of patients after general anaesthesia and regional anaesthesia, resulting in distinct signs and symptoms. Future research is anticipated to externally control blood pressure factors and measure biomedical outcomes in blood sugar and hemoglobin in relation to the incidence of post-anaesthesia hypothermia and suggestions for anesthesia practitioners to consider age and length of surgery because both have a relationship with the incidence of hypothermia, as well as for the Dr.R. Goeteng Taroendibrata Purbalingga hospital to consider the researcher.

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