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## Description Of Hemodynamic Status Of Conscious Extubation Of Patients With Tonsillectomy Procedures Using General Anesthesia

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### Abstract

*Post-tonsillectomy awake extubation under general anesthesia has the potential to trigger hemodynamic fluctuations due to sympathetic stimulation, but prospective data in the Indonesian context is still limited. This study aims to describe the hemodynamic status in the post awake extubation period in tonsillectomy patients. Using a descriptive quantitative design, the population included 29 patients aged 12–35 years at Wijayakusuma Hospital III Purwokerto (December 2025–January 2026) with total sampling. Primary data were measured via bedside monitors and observation sheets, and univariate analysis was performed using SPSS. The results showed that the majority of respondents were 17–25 years old (51.7%) and female (65.5%). In the post-awake extubation period, hemodynamic findings demonstrated pre-hypertensive systolic and diastolic blood pressure (44.8% and 55.2%, ), while mean arterial pressure (79.3%), pulse rate (62.1%), respiratory rate (75.9%), and oxygen saturation (100%) remained within normal limits.*

**Keywords:** General Anesthesia, Awake Extubation, Hemodynamics, Tonsillectomy, Vital Signs.

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## INTRODUCTION

Surgery is an invasive medical intervention that involves opening a body part, usually through a skin incision, to treat various pathological conditions. Globally, surgical procedures contribute significantly to the burden of disease, with approximately 11% of cases being treated through an operative approach (Ningrum, 2022). Recent trends indicate an increase in elective procedures post-pandemic, with tonsillectomy remaining one of the most common major interventions in children, driven by recurrent tonsillitis cases that burden the healthcare system (Alfarisi, 2021; Grace Kelly & Mengko, 2024).

In Indonesia, the prevalence of tonsillitis reaches 23%, with chronic tonsillitis at 3.8% as the second most common ENT disease after acute nasopharyngitis (Ramadhan, 2017). National epidemiological data confirms tonsillectomy as the main therapeutic option for chronic tonsillitis, especially in the pediatric population under 15 years, in line with a preliminary study at the Wijayakusuma Army Hospital in Purwokerto which recorded 32 cases in November 2025. This phenomenon is scientifically relevant because it highlights the need for postoperative monitoring, as well as being practical to improve patient safety in limited facilities (Andwidatu, 2025; Ramadhani, 2025).

Recent studies emphasize tonsillectomy as a major procedure requiring general anesthesia for removal of the palatine tonsils through the peritonsillar space, with close hemodynamic monitoring during awake extubation (Millizia, 2023; Brahmi, 2019). Amin's (2021) study reported significant changes such as hypertension, tachycardia, and oxygen desaturation due to reflex responses during extubation, which can lead to complications such as airway obstruction. Similarly, Kallesen (2015) and Schwartz (2025) highlighted the importance of parameters such as blood pressure, MAP, pulse rate, respiratory rate, and SpO<sub>2</sub> in detecting instability.

However, findings vary across studies; for example, a retrospective study in the UK recorded a tonsillectomy incidence of 2.5 per 1,000 children (Hayward, 2019), while Gudapuris (2020) reported a global range of 88.9–159.2 per 100,000 population, with inconsistencies in the post-extubation hemodynamic impact in the Southeast Asian context. The main limitations of previous studies lie in their retrospective design, small sample size, and the lack of specific focus on the hemodynamic

features of awake extubation in major tonsillectomies under general anesthesia, particularly in Indonesian military hospitals (Amin, 2021; Hayward, 2019).

A clear research gap arises from the lack of prospective data on hemodynamic status—including blood pressure, MAP, pulse rate, respiratory rate, and SpO<sub>2</sub>—during awake extubation in tonsillectomy patients in Indonesia. This research question is crucial because hemodynamic instability has the potential to worsen prognosis, as demonstrated in local preliminary studies, but has not been comprehensively explored (Schwartz, 2025; Brahmi, 2019).

This study's general objective was to describe the hemodynamic status during awake extubation in tonsillectomy patients under general anesthesia. Specific objectives included respondent characteristics (age, gender) and specific hemodynamic parameters. Its urgency lies in the increasing trend of tonsillectomies in Indonesia post-2025, where close monitoring can prevent complications. The novelty of this study lies in filling a local gap with a descriptive approach in the context of a military hospital, distinct from more general global studies. Theoretically, the results enrich the nursing anesthesiology literature; practically, they support the improvement of safety protocols for anesthesiologists and institutions (Ningrum, 2022; Amin, 2021).

## RESEARCH METHODS

This study used a descriptive quantitative design to describe the hemodynamic status of patients during awake extubation after tonsillectomy under general anesthesia, in accordance with a positivist approach that emphasizes empirical measurement through numerical data (Sugiyono, 2016). This approach allows for the presentation of phenomena as they are, factually, and systematically without variable manipulation, making it suitable for identifying the characteristics of specific populations in current conditions (Sudaryono, 2022). Similar design studies have proven effective in analyzing postoperative vital parameters, as demonstrated by studies by Amin (2021) and Emzir (2023) that highlight the reliability of univariate descriptions in the context of anesthesiology.

The study population included all 29 patients who underwent tonsillectomy under general anesthesia in the Central Surgical Installation (IBS) of Wijayakusuma Hospital III Purwokerto from December 2025 to January 2026, as defined as all elements with characteristics relevant to the study problem (Handayani, 2020). The sample was taken using a non-probability sampling technique, total sampling, where the entire population was sampled ( $n = 29$ ) to ensure full representation without selection bias, according to the formula  $N = n$  (Sugiyono, 2023). Inclusion criteria included patients aged 12–35 years who were willing to participate and undergo tonsillectomy procedures under general anesthesia, while exclusion criteria included patients with severe cardiovascular or respiratory disorders such as hypertension, COPD, or asthma that could potentially interfere with hemodynamics (I Made Sudarma Adiputra et al., 2021).

The primary research instrument was an observation sheet to document the hemodynamic status of awake extubation patients, including blood pressure, mean arterial pressure (MAP), pulse rate, respiratory rate, and oxygen saturation (SpO<sub>2</sub>), measured non-invasively using a bedside monitor. This sheet was accompanied by a request and consent form to ensure informed consent, with operational definitions of ordinal-scale variables such as blood pressure (normal <120/80 mmHg, pre-hypertension 120–129/80–89 mmHg, hypertension >140/90 mmHg) (Faridi et al., 2021). The instrument development process followed content validity standards through monitoring calibration and internal reliability testing, as recommended in recent observational studies of anesthesia (Syapitri et al., 2021).

The research procedure began in the preparation stage with proposal submission, institutional permit (number B/1131/XI/2025), preliminary study, and ethical clearance (KEPK/UMP/116/XII/2025), followed by coordination with the medical team at the research site. In the implementation stage, respondents were selected based on inclusion-exclusion criteria, then hemodynamic status was observed and recorded immediately after awake extubation using a bedside

monitor and observation sheet to ensure the accuracy of the primary data. The completion stage included complete data collection, analysis, and discussion of the results, with all steps designed chronologically for high replicability (Adiputra, 2021; Notoatmodjo, 2018).

Data analysis was conducted using univariate techniques to describe the frequency distribution, percentage, mean, median, and standard deviation of demographic variables (age, gender) and hemodynamics, using the latest version of the Statistical Package for the Social Sciences (SPSS) software. Data processing included editing for completeness, numerical coding (e.g., age: 1 = 12–16 years), data entry, tabulation, and cleaning to avoid missing data or input errors, thus producing accurate descriptions that align with the research objectives (Sugiyono, 2015). This approach is consistent with descriptive analysis of postoperative vital data, as applied in a similar study (Notoatmodjo, 2018).

The research's ethical considerations adhered to the principles of the Declaration of Helsinki, with written informed consent from each respondent to guarantee autonomy and the right to refuse, and data confidentiality was maintained through anonymity of respondent codes. Researchers implemented beneficence and non-maleficence through minimal-risk, non-invasive observation, respect for subjects, and ensured fairness through equal treatment, supported by ethical clearance from the Health Research Ethics Committee (KEPK/UMP/116/XII/2025) (Faridi et al., 2021; Syapitri et al., 2021).

## RESULTS AND DISCUSSION

### Respondent Characteristics

**Table 1. Respondent Characteristics Based on Age and Gender**

| Respondent characteristics | Frequency | Percentage (%) |
|----------------------------|-----------|----------------|
| Age                        |           |                |
| 12-16 Years                | 8         | 27.6           |
| 17-25 Years                | 15        | 51.7           |
| 26-35 Years                | 6         | 20.7           |
| Gender                     |           |                |
| Woman                      | 19        | 65.5           |
| Man                        | 10        | 34.5           |

Source: Primary Data 2026

Based on the table1. Most of the respondents were in the 17-25 age group, as many as 15 people (51.7%), followed by 12-16 age group as many as 8 people (27.6%), and 26-35 age group as many as 6 people (20.7%). Based on gender, the respondents were dominated by women as many as 19 people (65.5%), while men as many as 10 people (34.5%).

### Univariate Analysis

**Table 2. Univariate Analysis of Respondents' Hemodynamic Status (n = 29)**

| No | Variable                        | Category                        | Frequency | Percentage (%) |
|----|---------------------------------|---------------------------------|-----------|----------------|
| 1  | Blood pressure<br>systole       | Normal (< 120 mmHg)             | 7         | 24.1           |
|    |                                 | Pre-hypertension (120-129 mmHg) | 13        | 44.8           |
|    |                                 | Hypertension (>140 mmHg)        | 9         | 31.0           |
| 2  | Diastolic blood<br>pressure     | Normal (< 80 mmHg)              | 5         | 17.2           |
|    |                                 | Pre-hypertension (80-89 mmHg)   | 16        | 55.2           |
|    |                                 | Hypertension (>90 mmHg)         | 8         | 27.6           |
| 3  | Mean arterial pressure<br>(MAP) | Low (<70 mmHg)                  | 1         | 3.4            |
|    |                                 | Normal (70-110 mmHg)            | 23        | 79.3           |
|    |                                 | High (>110 mmHg)                | 5         | 17.2           |
| 4  | Pulse                           | Normal (60-100 x/minute)        | 18        | 62.1           |
|    |                                 | Tachycardia (>100 x/minute)     | 11        | 37.9           |

|   |                          |                          |    |       |
|---|--------------------------|--------------------------|----|-------|
| 5 | Respiratory Rate         | Normal (16-20 x/minute)  | 22 | 75.9  |
|   |                          | Tachypnea (>20 x/minute) | 7  | 24.1  |
| 6 | Oxygen saturation (SpO2) | Normal (95-100%)         | 29 | 100.0 |
|   |                          | Hypoxia (<96%)           | 0  | 0.0   |

Based on table 2 above, the majority of respondents were in the pre-hypertension category for systolic blood pressure (120-129 mmHg) as many as 13 people (44.8%) and in the range of 80-90 mmHg for diastolic blood pressure as many as 16 people (55.2%). However, most respondents had normal mean arterial pressure (MAP) values in the range of 70-110 mmHg as many as 23 people (79.3%), which indicates that tissue perfusion to vital organs is maintained adequately. Pulse and respiratory rate parameters, several respondents showed normal as many as 18 people (62.1%) and 22 people (75.9%) respectively, although there was an increase in some respondents as a form of physiological response to the conscious extubation process. All respondents (100%) had safe oxygen saturation (SpO2) values in the range of 95-100%.

## Discussion

### Characteristics of Respondents in Conscious Extubation Patients with Tonsillectomy Procedures Using General Anesthesia

#### Characteristics Based on Age

The results of a study conducted at RST Wijayakusuma Purwokerto showed that the majority of respondents were aged 17-25 years (51.7%). This is within the productive age range, with relatively good physiological conditions of the body's organs, particularly the cardiovascular and respiratory systems. Age is known to be a predictor of extubation outcomes, with patients over 65 years of age having a higher risk of extubation or reintubation failure due to degenerative processes that occur in the elderly phase, including decreased lung function, tissue elasticity, and respiratory muscle strength that affect inspiratory and expiratory abilities. Conversely, patients aged >18 years generally have a more optimal physiological response to the stress of anesthesia and ventilation recovery. (Koraag 2022).

#### Characteristics Based on Gender

The results of a study conducted at Wijayakusuma Hospital in Purwokerto showed that, based on gender, 19 respondents (65.5%) were predominantly female. The hemodynamic response to general anesthesia can be influenced by gender, as women are more likely to have different vascular characteristics and physiological sensitivities, making them more susceptible to fluctuations in blood pressure and pulse rate during the perioperative period. (Fogelson, 2025).

According to research (Andwidatu et al., 2025) which states that the most common gender in tonsillectomy patients is female, as many as 56 people (56%), which shows the suitability of the population characteristics with this study. This condition can contribute to the observed hemodynamic dynamics, especially during the extubation phase which is a period with high sympathetic stimulation due to airway stimulation, so that changes in blood pressure and pulse in the female respondent group can be influenced by both physiological factors of gender and reflex responses during the extubation process.

### Variable Characteristics

#### Blood pressure

The results of a study conducted at Wijayakusuma Hospital in Purwokerto showed that the majority of respondents experienced an increase in systolic and diastolic blood pressure to the pre-hypertension level (44.8%), and diastolic blood pressure to 80-89 mmHg (55.2%) during awake extubation. Awake extubation demonstrated a hemodynamic response that occurred upon endotracheal tube removal. This is in line with (Tiwari, 2024). Which states that awake extubation is associated with a higher hemodynamic response, including increased systolic blood pressure and hypertension, due to airway stimulation and sympathetic nervous system activity as the patient emerges from general anesthesia. This increase in blood pressure is a physiological response to stimulation of the

endotracheal tube that triggers the release of catecholamines, resulting in a transient increase in blood pressure during the recovery phase of anesthesia.

The study reported a significantly higher incidence of hypertension in the conventional awake extubation group (90%) compared to the alternative technique group (50%), with a P value of 0.002. These results indicate that awake extubation has the potential to cause an increase in blood pressure as a response to the body's recovery from anesthesia. Physiologically, this condition is due to mechanical stimulation of the airway during endotracheal tube removal, which activates the sympathetic nervous system, triggering the release of catecholamines, peripheral vasoconstriction, and increased cardiac output, resulting in a temporary increase in blood pressure.

These findings are supported by research showing that awake extubation provides the benefit of restoring protective airway reflexes, but increased reflex activity such as coughing and airway responses can stimulate the sympathetic nervous system, contributing to increased hemodynamic responses, including increased blood pressure. A study by Anam (2022) reported that conscious endotracheal extubation was associated with significant increases in systolic, diastolic, and mean arterial pressure (MAP) immediately after extubation due to airway stimulation and sympathetic activation. Therefore, efforts to minimize airway stimulation during extubation, such as the use of pharmacological agents, are needed to suppress the sympathetic response and reduce hemodynamic flactus during the anesthetic phase.

Not all patients in this study experienced significant increases in blood pressure, with some remaining within normal limits. This suggests that the hemodynamic response during extubation is multifactorial and influenced by various factors, such as age, physical status (ASA), depth of anesthesia, type of surgical procedure, and use of anesthetic agents.

Based on the results of this study, previous studies, and related literature, it can be concluded that increased blood pressure after awake extubation is a common physiological response caused by airway stimulation and activation of the sympathetic nervous system.

### **Mean Arterial Pressure (MAP)**

Research conducted at Wijayakusuma Hospital in Purwokerto showed that 79.3% of respondents maintained their mean arterial pressure (MAP) within the normal range. This indicates that, despite the hemodynamic response during awake extubation, tissue perfusion to vital organs remains well maintained.

This finding is in line with research Suo (2024). Which compared two anesthetic management techniques, where one group experienced a significant increase in MAP on several early measurements after extubation, while the other group showed minimal fluctuations. In addition, the study Dhananjaya (2020) also stated that an increase in MAP can occur immediately after extubation, but is transient and tends to return to near baseline in most patients.

Mean arterial pressure (MAP) is a crucial parameter in determining the adequacy of organ perfusion, particularly cerebral perfusion, which is highly dependent on MAP. A decrease in MAP (hypotension) can lead to decreased perfusion of vital organs such as the brain, kidneys, and heart, which can lead to tissue hypoxia and impaired organ function. Conversely, an increase in MAP (hypertension) can increase the workload of the heart and potentially lead to impaired perfusion due to excessive vasoconstriction. Therefore, the body maintains MAP within an optimal range through autoregulatory mechanisms to maintain stable tissue perfusion (Butterworth, 2022).

### **Pulse Frequency**

The results of a study conducted at RST Wijayakusuma Purwokerto showed that the majority of respondents (62.1%) had a normal pulse rate and maintained it within the normal range, although 37.9% experienced tachycardia (>100 beats/minute). This condition indicates that the awake extubation process can trigger a temporary hemodynamic response. Removal of the endotracheal tube is known to stimulate upper airway reflexes, particularly in the epipharyngeal and laryngopharyngeal areas, which activates the sympathetic nervous system, thereby triggering an increase in heart rate and blood pressure. (Jajjo 2013). According to research Swamy & Madhusudhana, (2018) also stated that

the endotracheal extubation process can cause a sympathetic stress response in the form of an increase in heart rate due to mechanical stimulation of the airways.

This condition is in line with the theory that states that stimulation of the airway during laryngoscopy or extubation can activate the sympathetic nervous system, thereby triggering an increase in heart rate and blood pressure as a physiological response. (Butterworth, 2022). Changes in heart rate are influenced by autonomic nervous system activation, with increased heart rate (tachycardia) occurring due to parasympathetic dominance. Therefore, the balance between these two systems plays a role in determining the hemodynamic response during extubation.

However, not all patients experience tachycardia. This can be influenced by several factors, such as the individual's physiological condition, the depth of anesthesia during extubation, and adequate anesthetic management. This indicates that while some respondents experienced an increased heart rate, the majority of patients maintained a normal heart rate due to physiological compensatory mechanisms and optimal anesthetic control.

### **Respiratory Rate**

The results of a study conducted at Wijayakusuma Hospital in Purwokerto showed that the majority of respondents (75.9%) maintained their respiratory rate within the normal range, while 24.1% experienced tachypnea (>20 breaths/minute). These findings indicate that the majority of patients were able to maintain adequate respiratory function in the post-awake extubation phase.

This condition reflects effective alveolar ventilation and good pulmonary perfusion, ensuring optimal gas exchange, as indicated by a respiratory rate within normal limits. It also indicates that most patients are able to maintain ventilation-perfusion matching, ensuring adequate respiratory function (Butterworth, 2022).

This finding is in line with research Lee (2025) which concluded that deep extubation and awake extubation result in different airway complication profiles, with each technique carrying certain risks during the recovery and post-extubation period, including changes in respiratory rate such as tachypnea. In addition, research Suo (2024) which states that the emergence phase after general anesthesia is a period susceptible to physiological changes, including those affecting the respiratory and circulatory systems. However, under optimal clinical conditions, most patients maintain adequate respiratory function, as reflected in the study results, where the majority of respondents had respiratory rates within normal limits.

The respiratory rate remains within the normal range in the post-awake extubation phase because the patient has returned to spontaneous breathing, where the respiratory center is functioning optimally after the effects of anesthesia have worn off. Furthermore, protective airway reflexes have recovered, maintaining airway patency, and ventilation-perfusion matching allows for adequate gas exchange. This condition eliminates the need for compensatory mechanisms such as increased respiratory rate (Butterworth, 2022).

A small proportion of patients experiencing tachypnea can be explained as a physiological response to airway stimulation during extubation, such as tracheal irritation or the cough reflex. Therefore, changes in respiratory rate, such as tachypnea, in some patients are an adaptive response within the compensatory range, without indicating respiratory distress.

### **Oxygen Saturation (SpO<sub>2</sub>)**

Research conducted at Wijayakusuma Hospital in Purwokerto showed that all respondents (100%) maintained oxygen saturation (SpO<sub>2</sub>) within the normal range. This indicates that awake extubation in tonsillectomy patients under general anesthesia does not significantly impair oxygenation, thus maintaining adequate gas exchange and tissue perfusion.

This is in line with research (Sucianti, 2022) At Sanjiwani Regional Hospital, most patients with general anesthesia maintained a normal SpO<sub>2</sub> (95-100%) after suctioning. This confirms that SpO<sub>2</sub> is maintained when the airway is clear and ventilation is effective.

Normal SpO<sub>2</sub> values in all respondents are influenced by several factors. First, extubation is performed in an awake state (awake extubation), allowing protective airway reflexes such as coughing and swallowing to recover, which play a role in maintaining airway patency and preventing

obstruction. Second, supplemental oxygen administration during and after extubation can maintain optimal oxygen saturation. Third, the pre-extubation suction procedure functions to clear secretions or blood from the airway, thereby reducing the risk of obstruction and ventilation disorders.

In addition, the patient's stable condition, the absence of respiratory complications, and adequate anesthetic management contributed to optimal oxygenation. Post-extubation oxygenation is greatly influenced by airway patency, effective ventilation, and adequate pulmonary perfusion, which is a component of ventilation-perfusion matching (Butterworth, 2022).

This, normal SpO<sub>2</sub> values in all respondents indicate that the conscious extubation process was running optimally, without causing oxygenation disorders, and was supported by proper airway and anesthesia management.

## CONCLUSION

This study found that most tonsillectomy patients under general anesthesia at Wijayakusuma Hospital III Purwokerto were aged 17-25 years (51.7%) and female (65.5%), with hemodynamic status after awake extubation showing an increase in systolic and diastolic blood pressure to the pre-hypertension category (44.8% and 55.2%, respectively), normal pulse rate (62.1%) although some experienced tachycardia, normal respiratory rate (75.9%), and normal oxygen saturation (SpO<sub>2</sub>) in all respondents (100%). Mean arterial pressure (MAP) was also mostly normal (79.3%), indicating maintained vital organ perfusion despite a transient sympathetic response due to airway stimulation.

However, limitations of this study include the small sample size (n=29) from a single military hospital center, the descriptive design without a control group comparison, and the potential for subjective observation bias in bedside monitor measurements. Future research suggests prospective, multicenter studies with larger sample sizes, multivariate analysis of confounding factors such as depth of anesthesia, and pharmacological interventions to control hemodynamic fluctuations. Practically, these findings encourage the development of strict post-extubation monitoring protocols for anesthesiologists to minimize the risk of complications and improve patient safety in similar settings.

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