

## Original Article

# The Postoperative Outcomes of General Anesthesia in Patients after Major Surgery

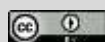
DOI: dx.doi.org

Md Anwarul Haque<sup>1\*</sup>, Md Iqbal Hossain<sup>2</sup>, Shymum Shahriar<sup>3</sup>

Received: 21 November 2023  
Accepted: 25 November 2023  
Published: 28 November 2023

Published by:  
Sheikh Sayera Khatun Medical  
College (SSKMC), Gopalganj,  
Bangladesh

\*Corresponding Author



This article is licensed under a  
[Creative Commons Attribution 4.0  
International License](https://creativecommons.org/licenses/by/4.0/).

**ABSTRACT**

**Introduction:** General anesthesia is a drug-induced reversible state comprising unconsciousness, amnesia, antinociception, and immobility, with maintenance of physiological stability. General anesthesia requires managing a complex array of anesthetic agents that act on an intricate web of neural connections or a neural nexus.

**Aim of the study:** This study aimed to analyze the postoperative outcomes of general anesthesia in patients after major surgery. **Methods and materials:** This prospective observational study was conducted at the Department of Anaesthesiology Dhaka National Medical Institute Hospital, Dhaka, Bangladesh from December 2022 to September 2023. A total of 100 surgery patients managed by general anesthesia were selected as study subjects purposively. After data collection, all data were processed and analyzed by MS Office tools. **Result:** In this study, the most common surgical procedure was joint replacement, with 25% of the participants, followed by

hysterectomy, also at 25%. In most of our patients (59%) with general anesthesia, opioids were administered for pain relief. Most commonly, patients experienced headache (18%) followed by nausea, vomiting, and pulmonary complications (15%). Significantly, 42% of patients experienced delayed reversal from general anesthesia effects, and 41% required a hospital stay until days 4-5. We found deep vein thrombosis in 13% of cases. **Conclusion:** General anesthesia, while essential for major surgeries, presents certain postoperative challenges that need attention. Patients often encounter extended recovery times and may require prolonged opioid use, leading to longer hospital stays.

**Keywords:** Outcome, Amnesia, General anesthesia, Surgery, Postoperative, Opioid

(The Insight 2023; 6(1): 144-149)

1. Junior Consultant, Department of Anaesthesiology, Dhaka National Medical Institute Hospital, Dhaka, Bangladesh
2. Junior Consultant, Department of Anaesthesiology, Dhaka National Medical Institute Hospital, Dhaka, Bangladesh
3. Junior Consultant, Department of Anaesthesiology, 250 Beded General Hospital, Jamalpur, Bangladesh

## INTRODUCTION

General anesthesia is a drug-induced reversible state characterized by unconsciousness, amnesia, antinociception (absence of pain sensation), and immobility, all while maintaining physiological stability <sup>[1]</sup>. Despite the perception that general anesthetics are non-specific in their action, they likely target a more limited set of specific sites than previously assumed. Historically, it was believed that the primary targets of anesthetics were the lipid components of nerve cell membranes. However, recent evidence suggests that clinically relevant concentrations of anesthetics have minimal effects on lipid bilayers <sup>[2]</sup>. General anesthesia comprises three main phases: induction, maintenance, and emergence <sup>[4]</sup>. During the induction phase, a small dose of a hypnotic drug, such as propofol, barbiturate, or etomidate, is administered. These drugs act on  $\gamma$ -amino-butyric acid type A (GABAA) receptors and induce a state of sedation, making the patient calm and easily arousable, typically with their eyes closed. As the dose is gradually increased, the patient may experience paradoxical excitation, and with further dose escalation, they eventually become unconscious <sup>[3]</sup>. Induction can also involve the use of opioids or benzodiazepines to mitigate heart rate increases, and vasopressors may be given to maintain blood pressure. Tracheal intubation, inserting a breathing tube, usually takes place at the end of the induction phase, following the administration of a muscle relaxant <sup>[4]</sup>. The maintenance phase of general anesthesia involves a combination of various drugs, including hypnotic agents, inhalational agents, opioids, muscle relaxants, sedatives, and cardiovascular drugs. This phase is also characterized by the provision of ventilatory and thermoregulatory support. Clinicians closely monitor clinical signs such as heart rate and blood pressure to assess the level of anesthesia during the maintenance period <sup>[5]</sup>. Emerging from

general anesthesia is a passive process influenced by multiple factors, including the drug doses administered, the site of action of the drugs, their potency, pharmacokinetics, the patient's physiological characteristics, and the type and duration of the surgical procedure <sup>[6]</sup>. Someone typically assess recovery from general anesthesia by observing physiological and behavioral signs. General anesthetics, both intravenous and volatile, exert their effects by either enhancing inhibitory transmission or blocking excitatory transmission. For example, drugs like propofol, barbiturates, etomidate, and benzodiazepines act as agonists at the GABA receptor, resulting in varying degrees of sedation, hypnosis, muscle relaxation, and anxiolysis <sup>[7,8]</sup>. In contrast, substances like ketamine, nitrous oxide, and xenon have a different mechanism of action, primarily involving the inhibition of the excitatory NMDA receptor, with little impact on the GABAergic system. Ketamine and nitrous oxide are potent agonists at the opioid  $\mu$  receptors and can reduce glutaminergic excitatory transmission through presynaptic inhibition of neurotransmitter release <sup>[9,10]</sup>. The specific receptors, their extent, distribution, and subunit composition, determine how different anesthetic agents affect individual patients. This variability, both within and among patients, provides anesthesia practitioners with a reasonable flexibility in tailoring their approach to anesthesia administration <sup>[11]</sup>.

## OBJECTIVE

### General Objectives

- To assess the postoperative outcomes of general anesthesia on patients undergoing major surgeries.

### Specific Objectives

- To examine the age distribution of the subjects in the study.

- To assess the indications for the surgeries performed on the respondents.
- To determine the duration of hospital-stay after surgery.
- To investigate the occurrence of deep vein thrombosis among the study population.

## METHODS & MATERIALS

This was a prospective observational study and was conducted at the Department of Anaesthesiology, Dhaka National Medical Institute Hospital, Dhaka, Bangladesh from December 2022 to September 2023. The study included a total of 100 surgery patients who were managed using general anesthesia, and these patients were purposively selected as study subjects. Informed written consent was obtained from all study subjects.

### Inclusion Criteria

- Patients seeking elective major surgeries (such as thoracic, abdominal, extremities, gynecological, etc.).
- Patients without contraindications for general anesthesia.
- Patients with a left ventricular ejection fraction greater than 35%.

### Exclusion Criteria

- Patients younger than 18 years and older than 70 years.
- Patients who underwent emergency surgeries.
- Patients with multiple co-morbid conditions.

In this study, patient evaluation involved a thorough medical history and physical examination. All essential investigations were conducted prior to the administration of anesthetic, analgesic medication, and surgical procedures. Post-operative outcomes were regularly recorded. The collected data was subsequently processed and analyzed using a descriptive method.

It's important to note that patient confidentiality was strictly maintained, and the data was utilized exclusively for the purpose of this study.

## RESULTS

In this study, the highest percentage of participants, 32.0%, fell within the 29-39 age range, followed by 26.0% in the 40-50 age group. There were also 24.0% of participants aged over 50, and 18.0% of participants aged 18-28. Joint replacement and hysterectomy were the most common indications of surgery, each representing 25.0% of the cases. Broken bone repair and cholecystectomy accounted for 5.0% and 9.0% of the cases, while stent procedures represented 15.0% of the indications. The postoperative outcomes of the study participants were analyzed, revealing various issues. Postoperative apnea was observed in 5.0% of the cases, while nausea and vomiting affected 15.0% of the participants. Headache was reported in 18.0% of the cases, and 13.0% experienced arrhythmia. Most patients (59.0%) required opioids post-surgery, and 15.0% of the cases faced pulmonary complications. In this series, 42% of patients experienced delayed recovery from the effects of general anesthesia. Notably, 41% of patients needed a hospital stay lasting 4 to 5 days. This study revealed that 13% of patients developed deep vein thrombosis following surgeries conducted with general anesthesia.

**Table I: Age distribution of respondents (N=100)**

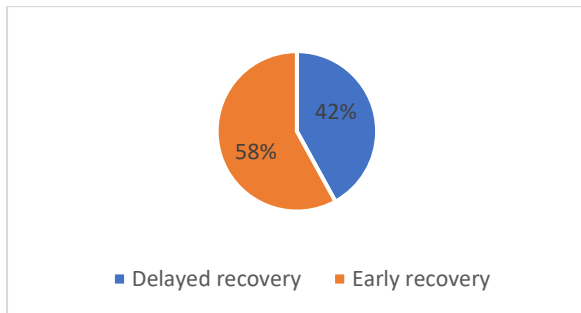
Age (Years)	n	%
18-28	18	18.0
29-39	32	32.0
40-50	26	26.0
>50	24	24.0

**Table II: Distribution of surgery indications**

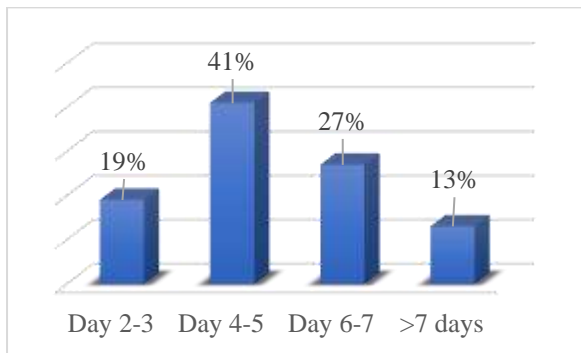
Indication	n	%
Joint replacement	25	25.0
Broken bone repair	15	5.0
Angioplasty	10	10.0
Stent procedures	05	15.0
Hysterectomy	25	25.0
Cholecystectomy	13	13.0

**Table III: Postoperative outcomes**

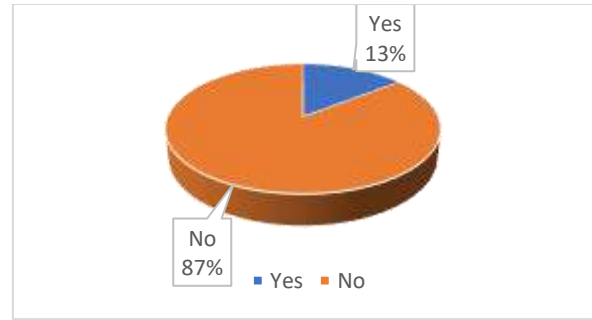
Outcomes	n	%
Postoperative apnea	05	5.0
Nausea and vomiting	15	15.0
Headache	18	18.0
Arrhythmia	13	13.0
Opioid needed	59	59.0
Pulmonary complications	15	15.0



**Figure 1: Distribution of recovery period**



**Figure 2: Hospital stay of participants**



**Figure 3: Occurrences deep vein thrombosis (N=100)**

**DISCUSSION**

In this study, joint replacement and hysterectomy were the most common indications of surgery, each representing 25.0% of the cases, followed by 15% for broken bone repair [12]. Regarding the outcome of general anesthesia after surgery, most of the patients (59%) needed opioids for pain relief. In this study, 18% of the patients experienced headaches, followed by 15% with 'nausea and vomiting' and pulmonary complications. A study by Pugey AJ et al. reported that 57.1% of patients undergoing knee arthroplasty were managed with general anesthesia [12]. After adjusting for potential confounders, the overall likelihood of complications was significantly higher in association with general anesthesia. The study concluded that patients undergoing total knee arthroplasty with general anesthesia had a small but significant increase in the risk of complications compared to those managed with spinal anesthesia. In a study by Weibel S. et al., 32% of patients underwent gynecologic surgery, and 19% had gastrointestinal surgery under general anesthesia using volatile anesthetics (88%) [13]. The study highlighted that postoperative nausea and vomiting (PONV) is a common adverse effect of general anesthesia and surgery, affecting up to 80% of patients. Another study reported that 8% of patients experienced severe nausea, with the highest incidence of emetic sequelae observed in gynecological patients; 52% of the 822 patients who received general

anesthesia [14]. In this series, 42% of the patients experienced delayed reversal from the effects of general anesthesia, which is consistent with the findings of Khare A. et al. [15]. The delay in awakening from anesthesia continues to be a significant challenge for anesthesiologists, especially with the widespread use of fast-acting anesthetic agents that typically result in rapid postoperative awakening. Various factors can influence the time required for a patient to emerge from anesthesia, including patient-specific characteristics, anesthetic choices, surgical duration, and painful stimuli. Delayed awakening after anesthesia is often attributed to the effects of anesthetic agents and medications administered during the perioperative period [16]. However, it's essential to note that anesthetic agents are not always the sole cause of delayed emergence [17]. In terms of the length of hospital stay, most patients (41%) in this study required hospitalization for 4-5 days. A combination of preoperative, intraoperative, and postoperative factors can influence prolonged hospital stays, as described by Collins TC et al. [18]. Sometimes, the use of general anesthesia may contribute to an extended hospital stay [19]. This study revealed that 13% of the patients developed deep vein thrombosis following surgeries performed under general anesthesia. Prins MH et al. conducted a study to assess the evidence regarding the risk of deep vein thrombosis (DVT) after hip surgery and found that the risk was lower with regional anesthesia than with general anesthesia [20]. Similarly, McKenzie PJ et al. performed a study in which they randomly assigned forty patients with fractured necks of the femur to undergo surgery under either general anesthesia (GA) or subarachnoid anesthesia (SAB). They observed that the incidence of DVT, determined through venography, was 40% in the SAB group, significantly lower than the 76.2% incidence in the GA group [21]. However, Neuman MD et al. conducted a study

indicating that, for older adults undergoing hip-fracture surgery, spinal anesthesia did not show superiority over general anesthesia in terms of survival and recovery of ambulation at 60 days [22].

### **Limitations of the study**

This study was conducted in a single hospital with a relatively small sample size. As a result, the findings and conclusions drawn from this research may have limitations in terms of generalizability to the broader population. It's essential to consider these constraints when interpreting the results and applying them to a larger community or diverse patient populations.

### **CONCLUSION**

This study concludes that, though general anesthesia is necessary for major surgeries, it still has some drawbacks concerning the postoperative outcome which should be addressed. Patients experience delays in recovery time after surgery. Moreover, prolonged opioid use and longer duration of stay in hospital is also seen among post-operative patients.

**Funding:** No funding sources

**Conflict of interest:** None declared

**Ethical approval:** The study was approved by the institutional ethics committee

### **RECOMMENDATION**

There is growing concern regarding the impact of general anesthesia on children, obstetric cases, and obese patients. More studies should be conducted to get robust data about the benefits and disadvantages of general anesthesia. With the complexities and nuances of different anesthetic methods, patients, and procedures, the planning and execution of anesthesia for all patients should be monitored strictly to minimize adverse effects.

## REFERENCES

1. Brown EN, Pavone KJ, Naranjo M. Multimodal general anesthesia: theory and practice. *Anesthesia and analgesia*. 2018 Nov;127(5):1246.
2. Franks NP, Lieb WR. Mechanisms of general anesthesia. *Environmental health perspectives*. 1990 Jul; 87:199-205.
3. Davis MH, Coleman MR, Absalom AR, et al. Dissociating speech perception and comprehension at reduced levels of awareness. *Proc Natl Acad Sci U S A* 2007; 104:16032-16037
4. Gray AT, Krejci ST, Larson MD. Neuromuscular blocking drugs do not alter the pupillary light reflex of anesthetized humans. *Arch Neurol* 1997; 54:579-584
5. Prys-Roberts C. Anaesthesia: a practical or impractical construct? *Br J Anaesth* 1987; 59:1341-1345
6. Brown EN, Lydic R, Schiff ND. General anesthesia, sleep, and coma. *New England Journal of Medicine*. 2010 Dec 30;363(27):2638-50.
7. Harris R, Mihic S, Dildy-Mayfield J, Machu T. Actions of anesthetics on ligand-gated ion channels: role of receptor subunit composition. *FASEB J*. 1995; 9:1454-1462
8. Belelli I, Pistis I, Peters JA, Lambert JJ. General anesthetic action at transmitter-gated inhibitory amino acid receptors. *Trends Pharmacol Sci*. 1999; 20:496-502.
9. Yamakura T, Harris R. Effects of gaseous anesthetics nitrous oxide and xenon on ligand-gated ion channels. *Anesthesiology*. 2000;93: 1095-1101.
10. Ostermeier A, Schlosser B, Schwender D, Sutor B. Activation of mu and delta opioid receptors causes presynaptic inhibition of glutaminergic excitation in neocortical neurons. *Anesthesiology*. 2000; 93:1053-1063.
11. Villars PS, Kanusky RJ, Dougherty TB. General anesthesia. *AANA journal*. 2004 Jun;72(3):197.
12. Pugely AJ, Martin CT, Gao Y, Mendoza-Lattes S, Callaghan JJ. Differences in short-term complications between spinal and general anesthesia for primary total knee arthroplasty. *Jbjs*. 2013 Feb 6;95(3):193-9.
13. Weibel S, Rücker G, Eberhart LH, Pace NL, Hartl HM, Jordan OL, Mayer D, Riemer M, Schaefer MS, Raj D, Backhaus I. Drugs for preventing postoperative nausea and vomiting in adults after general anesthesia: a network meta-analysis. *Cochrane Database of Systematic Reviews*. 2020(10).
14. Koivuranta M, Läärä E, Snäre L, Alahuhta S. A survey of postoperative nausea and vomiting. *Anesthesia*. 1997 May;52(5):443-9.
15. Khare A, Meena S, Sethi P, Bafna U, Gill N. Delayed recovery from general anesthesia due to severe hypoglycemia in a non-diabetic adult. *Journal of the College of Physicians and Surgeons Pakistan*. 2015 Aug 1;25(8):627-8.
16. Misal US, Joshi SA, Shaikh MM. Delayed recovery from anesthesia: A postgraduate educational review. *Anesthesia, essays, and research*. 2016 May;10(2):164.
17. Kalra S, Wadhwa R. Role of amino acid infusion in delayed recovery from neuromuscular blockers. *Indian Journal of Anaesthesia*. 2010 Mar;54(2):166.
18. Collins TC, Daley J, Henderson WH, Khuri SF. Risk factors for prolonged length of stay after major elective surgery. *Annals of surgery*. 1999 Aug;230(2):251.
19. Magnusson L, Spahn DR. New concepts of atelectasis during general anesthesia. *British journal of anaesthesia*. 2003 Jul 1;91(1):61-72.
20. Prins MH, Hirsh J. A comparison of general anesthesia and regional anesthesia as a risk factor for deep vein thrombosis following hip surgery: a critical review. *Thrombosis and haemostasis*. 1990;64(08):497-500.
21. McKenzie PJ, Wishart HY, Gray I, Smith G. Effects of anesthetic technique on deep vein thrombosis: a comparison of subarachnoid and general anesthesia. *BJA: British Journal of Anaesthesia*. 1985 Sep 1;57(9):853-7.
22. Neuman MD, Feng R, Carson JL, Gaskins LJ, Dillane D, Sessler DI, Sieber F, Magaziner J, Marcantonio ER, Mehta S, Menio D. Spinal anesthesia or general anesthesia for hip surgery in older adults. *New England Journal of Medicine*. 2021 Nov 25;385(22):2025-35