



The Healer Journal of Physiotherapy and Rehabilitation Sciences



Journal homepage: www.thehealerjournal.com

Postoperative Complications of Anaesthesia following Appendectomy

Asad Bilal¹, Bushra Muneer², Muhammad Saif Ullah¹, Sumbal Shahbaz^{1*}, Rafia Ali¹, Muhammad Noman¹

¹Department of Health Professional Technologies, The University of Lahore, Lahore, Pakistan

²Institute of Industrial Biotechnology, Government College University, Lahore, Pakistan

KEYWORDS

Acute Appendicitis
Anaesthesia
Open Appendectomy
Post-operative
Complications

DECLARATIONS

Conflict of Interest: None
Funding Source: None

CORRESPONDING AUTHOR

Sumbal Shahbaz
Department of Health
Professional
Technologies, The
University of Lahore,
Lahore, Pakistan
sumbal.shahbaz@dhpt.uol.edu.pk

ABSTRACT

Background: Appendectomy is usually performed as an urgent or emergency operation to treat severe acute appendicitis. Surgical technique has moved usually toward laparoscopic appendectomy in the early 21st century. Common post-operative complications following appendectomy patients included fever, hypotension, hypertension, hypothermia, and death. **Objective:** To identify the postoperative complications of anaesthesia following appendectomy. **Methodology:** This cross-sectional study was conducted using a convenient sampling technique. Data was collected through a questionnaire comprising questions related to post-operative complications following appendectomy. The sample size was 79 calculated based on prevalence (28.60%). Patients who underwent appendectomy were included in the study. Pediatric patients and laparoscopic surgeries were excluded. A total of 79 participants were investigated during this research. The participants were informed that there was no risk involved during this study. The postoperative complications of appendectomy like nausea, vomiting, pain, hypertension, hypotension and blood loss were noted. For the variables like age and gender mean and standard deviation were calculated and the frequency was used for the rest of the variables. **Results:** About 43 patients (54.4%) experienced periumbilical pain and 36(45.6%) patients did not experience periumbilical pain. 23(29.1%) patients had vomiting 56 (70.9%) patients did not experience vomiting. 16(20.3%) experienced agitation and 63 (79.7%) patients did not experience agitation. 17 (21.5%) patients had bleeding and 62 (78.5%) patients did not have bleeding. 23 (29.1%) patients had hypoxia and 56(70.9%) patients didn't experienced Hypoxia. 10(12.7%) patients had hypothermia and 69 (87.3%) patients did not have hypothermia. 13(16.5%) patients had hypertension and 66 (83.5%) patients did not have hypertension. 8(10.1%) patients had hypotension and 71(89.9%) patients did not experienced hypotension. While 26(32.9%) had fever and 53(67.1%) did not have fever. **Conclusion:** It is concluded that there were minimum complications after surgery and patients did not complain about any severe illness after appendectomy.

How to cite the article: Bilal A, Muneer B, Fayyaz M, Ullah MS, Shahbaz S, Ali R, Noman M. Postoperative Complications of Anaesthesia Following Appendectomy. The Healer Journal of Physiotherapy and Rehabilitation Sciences. 2024;4(5):15-21.



Copyright©2024. The Healer Journal of Physiotherapy and Rehabilitation Sciences.
This work is licensed under [Creative Commons Attributions 4.0 International license](https://creativecommons.org/licenses/by/4.0/).

INTRODUCTION

Oliver Wendell Holmes introduced the word 'anaesthesia' in November 1846 which was only one month after the public demonstration of painless surgery with ether. This term is derived from the Greek word meaning insensibility which relates to a condition in which the form of life is powerless to the changes from the outside world at this stage. The anaesthetized condition was seen in the 21st century as essentially in a cautious environment, with restorative endpoints that include amnesia, analgesia, immobility, and consciousness.¹ A constant difficulty facing the practising anesthesiologist is the remarkable inconsistency of an offered patient's response to a certain portion of an individual medication and, precisely, pain relief drugs.² Adequate anaesthesia dose reduces toxicity and death rate and decreases anaesthesia-related medication costs.³ The appendix appears to be a small structure looking like a stalk hanging at the base of the colon.

The appendix gets inflamed or infected sometimes and is to be removed surgically and the procedure is called an appendectomy. It is the most common surgery done with approximately 1 in 2000 persons during his or her lifetime. An open appendectomy, the traditional surgery for appendicitis, requires a medium cut and general anaesthesia is preferred usually but some cases require spinal anaesthesia.⁴ Acute appendicitis should be diagnosed properly and not be confused with other abdominal painful diseases. Delays in diagnosis are associated with higher rates of perforation and cause higher morbidity.⁵ A trial of antibiotics treatment in uncomplicated acute appendicitis is still an option that is worth trying. Patients on antibiotics didn't require appendectomy during the six-month follow-up period.⁶ The effect of general anaesthesia on perioperative outcomes has been controversial. The central neuraxial blocks, including the cerebrospinal, epidural, regional anaesthesia techniques, and offer a lot of advantages in comparison with general anaesthesia.

The use of regional anaesthesia has several advantages, such as excellent, pain, fewer side effects, less blood loss, improved heart and lung disease, and reduced time spent in the area after the anaesthesia.⁷ Spinal anaesthesia is safe, cost-effective with minimal postoperative complications, efficient, and effective for

appendectomy in the emergency setting as compared to general anaesthesia with or without endotracheal intubation and general anaesthesia showed more postoperative nausea, vomiting, and other complications.⁸ As the open and laparoscopic approach was compared, The laparoscopy became a secure and efficient operative process in appendectomy and it supplied clinically beneficial benefits over the open method, inclusive of shorter hospital stay, decreased need for postoperative analgesia, early meal tolerance, earlier return to work, decrease the price of wound contamination.⁹

There are many mainly three main types of anaesthesia; general anaesthesia puts you in a deep sleep that is superintended by an anaesthetist. General anaesthesia is necessary in some cases like knee replacement, cardiac surgeries, and many other types of procedures for cancer treatment. General anaesthesia is given through injection or in gaseous form that is to be inhaled. There's inhibition or blocking of ion channels with stimulating compounds and stronger inhibiting ion channel sensitivity along with γ -ammonium butyrate receptor. That causes a sleep-like state and patients come to senses as anaesthetics are slowly removed from receptors. The time it takes to recover from inhalation sedation is determined by how quickly the analgesic is eliminated from the brain.¹⁰

Anaesthetic performance is described by using the minimum alveolar awareness required to save you a response to a surgical reaction. Anaesthetics taken lower the metabolic hobby in the mind. The reduced metabolic process in the brain fee usually lowers blood pressure to float within the mind. The internet impact on drift (boom, lower) based on the attention of anaesthesia drugs brought. A boom in blood supply to the brain glide is medically unpleasant for sufferers who have accelerated cerebral strain view of mind tumour intracranial haemorrhage and head injury. Therefore, the admin in excessive volatile anaesthetics concentrations is unfavourable in sufferers such as extended cerebral stress. Nitrous oxide can excess cranial blood flow or reason accelerated cerebral stress. Their impact to maximum possibly induced by sympathetic nervous system activation apprehensive systems. Therefore, nitrous oxide possibly mixed and including sellers strategies this lessen cranial blood waft sufferers to multiplied cerebral stress.

Traditionally, anaesthetic results in the mind development of four levels increased intensity of the central nervous system melancholy, analgesia, the affected person begins with studies analgesia without amnesia, each analgesia and amnesia are produced, excitement, in the course of this stage, the affected person seems delirious, might also vocalize however is completely amnesic.

Breathing is speedy, and heart rate and blood stress increase, In surgical anaesthesia, this level starts evolving with slowing of respiration and heart fee and extends to finish cessation of spontaneous breathing, medullary melancholy the profound level of analgesia implies intense melancholy of central nervous system which included vasomotor middle within medulla to breathing centre in the brainstem. Inhale anaesthesia generally tends to decrease myocardial oxygen consumption which reflects melancholy ordinary reduced arterial blood pressure and cardiac contractility. All dangerous medications have varying stages of bronchodilation residence impact of cost patients with energetic asthmatic conditions and wheezing. Airway irritation which may initiate coughing breath-retaining induced by using pungency some risky anesthetic. Inhaled anaesthetics tend to reduce glomerular filtration percentage urine glide. Risky anaesthetics cause a concentration-based decrease in portal vein blood float that parallels the decline in cardiac output produced. However, halogenate renal blood glide is also decreased by the uterine musculature seems to be unaffected by laughing gas. Certain drugs but filtration fraction is increased, suggesting that autoregulation of efferent arteriole tone compensates for and limits the drop in anaesthetics are mighty uterine muscle relaxants and convey this effect in concentration-structured style. It is able to additionally cause expanded uterine bleeding.¹¹ This prevents any ache in the small location of the surgical treatment, but you live awake. This numbs a bigger region of your frame, like your legs, however, you also stay wakeful.

Some human beings have memory problems once they get widespread anesthesia. That is extra commonplace in people with coronary heart disease, lung disorder, Alzheimer's, or Parkinson's ailment. The medical doctor has to tell you approximately all of these viable headaches earlier than your surgical operation.¹² Some kinds of anesthesia can encompass just mild sedation, further to widespread anaesthesia, or can inject

both a small vicinity (neighbourhood anaesthesia) and a larger area (nearby anaesthesia) of the frame via the numbness. In any event, all sedation is at risk of heart attacks, pneumonia, sore throat, vomiting may occur after general anaesthesia. Certain people get a risk of headaches after spinal anaesthesia risks are based on the type of anaesthesia.¹³ The high doses of local anaesthesia the aesthetic can affect the rest of the body and affect your mind and cardiac.¹⁴ Some medical issues cardio-pulmonary disease increase chance of problems from anesthesia, taking certain medicines, smoking, and drugs can increase the chance of complications.¹⁵

Anesthesia can cause biological changes that may lead to toxicity and death. As a result, it is frequently considered the highest-risk task.¹⁶ The normal complaint included nausea, vomiting, reflex headache sore throat, cerebral pain tiredness confusion dental damage, severe nerve injury, and peripheral embolisms.¹⁷ John Collins Warren (1778-1856) performed first successful surgical procedure using anaesthesia on October 16, 1846 and made history. Dr. Morton proved that when gas is inhaled properly, provides safe and successful anesthesia.¹⁸ First successful surgery with anaesthesia Morton in 1845 one year in an advance test with nitrous oxide (laughing gas).¹⁹ In Scotland in 1847 obstetrician Professor James Y. Simpson begins induced ladies chloroform facilitate the distress of labor Chloroform rapidly turns into a common sedative for a medical procedure and dental methodology also, the exhibition hall site says. Chloroform was found independent in 1831 by the USA's Samuel Guthrie, France's Eugène Soubeiran and Germany's Justus von Liebig.²⁰

In the research of WHO calculation based on data from 56 members of states 230 million surgical procedures are performed under anesthesia every year in the world.²¹ The approximate mortality connected from anaesthesia to 4.7 in 100,000 anesthetic surgical procedures (3.1–6.3 in 100,000) i.e. 1 death for every 21,200 surgical anaesthesia surgeries.²² The most commonly performed operation in the world is appendectomy and appendicitis that is the most frequent acute surgical procedure of the abdomen. Roughly 250,000 instances of appendicitis happened every year in the United States during this period, representing an expected 1 million medical clinic days of the year. The most noteworthy rate of essential positive

appendectomy (appendicitis) was found in people matured 10 to 19 years (23.3 per 10,000 population each year); guys had higher paces of appendicitis than females for all age gatherings (by and large rate proportion, 1.4:1).²³ For over a century, open appendectomy (OA), which was first identified by McBurney in 1894, has been considered the gold standard of appendectomy. However, due to the advantages of being minimally invasive, laparoscopic appendectomy (LA) has been performed more commonly than OA since its introduction by Semm in 1983.²⁴

Appendicitis is a common condition found in emergency rooms. Appendectomy, either laparoscopically or openly, is usually used to treat it. As a result, an appendectomy is a common surgical surgery. Every operation has the potential for both short and long-term problems. Infections and intra-abdominal abscesses are the most common short-term consequences following an appendectomy. Acute appendicitis affects about 7 to 10% of the general population, with the highest rates occurring in the second and third decades of life.²⁵ The removal of the appendix may contribute to the development of inflammatory bowel disease (IBD) or cancer. In addition, a ruptured appendix has been linked to infertility due to the inflammation and severe scarring it causes.²⁶ Appendectomy during the day reduces the use of nursing, anaesthesia, and surgical staff during the night hours, potentially reducing the risk of medical errors. In patients with nonperforated appendicitis, however, some studies indicate that delaying appendectomy is risky and raises the risk of surgical site infection.²⁷ There is a limited study performed on the postoperative complications of anaesthesia related to appendectomy patients in Pakistan. The purpose of the study was to identify postoperative complications of anaesthesia in patients after appendectomy.

METHODOLOGY

This was a cross-sectional study conducted by using convenient sampling technique. Data was collected through questionnaire comprising question related to post-operative complication following appendectomy. Sample size was 79 calculated on the basis of prevalence (28.6%). Patients who underwent appendectomy were included in the study. Pediatric patients and laproscopic surgeries were excluded. A total of 79 participants were investigated during this research. The participants were informed that there is no risk involved during this study. The post-operative

complication of appendectomy like nausea, vomiting, pain, hypertension, hypotension and blood loss were noted. For the variables like age and gender mean and standard deviation was calculated and the frequency was used for the rest of variables.

RESULTS

Table 1 shows that 39 (49.4%) patients belong to 22 to 30 years of age category, 40(50.6%) patients belongs to 30-50 age category in total population. Table 2 shows the frequencies of different complications factors, data shows that Out of 79 patients, 43 patients (54.4%) suffer from periumbilical pain, 23 patients (29.1%) suffer from vomiting, 16 patients (20.3%) suffer from agitation and 17 patients (21.5%) suffer from bleeding, 23 patients (29.1%) suffer from hypoxia, 10 patients (12.7%) suffer from hypothermia, 13 (16.5%) patients were suffering from hypertension, 8 patients (10.1%) suffer from hypotension, 26 patients (32.9%) suffer from fever.

DISCUSSION

In USA, people from rural areas have more rates of acute appendicitis than urban areas 35.76% were from rural and 31.48% from Urban.²⁸ In Pakistan people from urban areas showed more perforated appendix. It is because the living standard of our urban area is not that good and the quality of food is better in rural areas. Inflamed appendix is most common between the ages of 10 to 20 years. A male preponderance exists, with a male-to-female ratio of 1.4:1. The risk for males was 8.6% and for females was 6.7% in the United States.²⁹ We also found that the ratio of acute appendicitis is higher in males than in females. The most common procedure used in Pakistan still is open appendectomy while the USA and other advanced states use Laparoscopic appendectomy. Laparoscopic becoming standard for surgical removal of inflamed appendix.³⁰ The duration for this surgery is normally two hours and our report shows that 81.18% of surgeries also took two hours. It is shown that laparoscopic appendectomy is the treatment of choice and blood loss in laparoscopic appendectomy is less.³¹ Most patients are unaware of post-operative complications of anesthesia as only 1.9% of patients were aware. Pain that "shifts" from the original site to another site in the abdomen is

Table 1: Demographics

Variables		Frequency (%)
Age (years)	22 to 30	39 (49.4%)
	31 to 50	40 (50.6%)
Gender	Male	46 (58.2%)
	Female	33 (41.8%)
Total		79 (100.0%)

Table 2: Frequencies of post-operative complications

Variables		Frequency (%)
Periumbilical pain	Yes	54.4
	No	45.6
Vomiting	Yes	29.1
	No	79.9
Agitation	Yes	20.3
	No	79.7
Bleeding	Yes	21.5
	No	78.5
Hypoxia	Yes	29.1
	No	70.9
Hypothermia	Yes	12.7
	No	87.3
Hypertension	Yes	16.5
	No	83.5
Hypotension	Yes	10.1
	No	89.9
Fever	Yes	32.9
	No	67.1

mostly linked to acute appendicitis where periumbilical pain that is present early in the course of the disease is replaced with right lower quadrant pain when the parietal peritoneum becomes involved with the inflammatory process.³² Forty-nine per cent of patients experienced this pain according to our studies. Post-operative nausea and vomiting (PONV) was a major issue after surgeries. Understanding the mechanism of PONV was helpful and assessment of adverse factors of PONV can reduce its risk.³³ In 76.23% of patients did have PONV in our study. Out of 27 children, two patients presented agitation during sevoflurane inhalation.³⁴ Similarly, our study shows the least patients agitation of 424 patients were included. The

overall incidence of early post-operative hypoxemia was 113 (26.7%). The risk factors of early postoperative hypoxemia were preoperative oxygen saturation <95%, general anaesthesia, and surgical duration ≥120 min.³⁵ During this study 29.1% patients showed hypoxia which indicates improved patient handling. Hypothermia is associated with many adverse effects, such as increased cardiovascular complications, blood loss and transfusion requirements, perioperative haemorrhage, and infection rate.³⁶ Hypothermia did not occur in most of the patients during our study. The thirty-day post-appendectomy mortality rate was 2.1/1000. Increased mortality was found in patients over 60 years of age. Negative appendectomy and complicated appendicitis were related to mortality. The frequency of appendectomy rate was higher in patients older than 40 years of age. However, during our study mortality was 0 out of 99 patients and overall control of post-operative complications was controlled to a great extent from previous years open appendectomy is still preferred in Pakistan but there is an improved understanding of the mechanism of PONV if we compare from previous years.

CONCLUSION

It is concluded that there were minimum complications after surgery and patients did not complain about any severe illness after appendectomy.

DECLARATIONS

Consent to participate: Written consent had been taken from patients. All methods were performed following the relevant guidelines and regulations.

Availability of data and materials: Data will be available on request. The corresponding author will submit all dataset files.

Competing interests: None

Funding: No funding source is involved.

Authors' contributions: All authors read and approved the final manuscript.

REFERENCES

1. Kelz MB, Mashour GAJCB. The biology of general anesthesia from Paramecium to primate. 2019; 29(22): R1199-R210.
2. Gray K, Adhikary SD, Janicki PJJoa, clinical pharmacology. Pharmacogenomics of analgesics in

anesthesia practice: A Current Update of Literature. 2018; 34(2): 155.

3. Dowell D, Haegerich TM, Chou RJJ. CDC guideline for prescribing opioids for chronic pain—United States, 2016. 2016; 315(15): 1624-45.

4. Torpy JM, Burke AE, Golub RM. JAMA patient page. Appendectomy. JAMA. 2011; 306(21): 2404.

5. Salam SS, Chinglensana L, Priyabarta Y, Sharma MBJJoEoM, Sciences D. Acute appendicitis in elderly patients-challenges in diagnosis and management. 2018; 7(32): 3585-90.

6. Kandaan AURJJoSP. Antibiotic Therapy Versus Appendectomy for Uncomplicated Acute Appendicitis. 2020; 25(1): 3-7.

7. Macfarlane A, Prasad G, Chan V, Brull RJBjoa. Does regional anaesthesia improve outcome after total hip arthroplasty? A Systematic Review. 2009; 103(3): 335-45.

8. Latif A, Bhatti MF, Qadir A, Shahwar ZA, Shahzad SJPJOM, SCIENCES H. Effectiveness of Anaesthesia for Appendectomy: comparison of spinal anaesthesia with other modalities being practiced in Emergency Department of Allama Iqbal Memorial Teaching Hospital. 2017; 11(4): 1402-6.

9. Biondi A, Di Stefano C, Ferrara F, Bellia A, Vacante M, Piazza LJWJoES. Laparoscopic versus open appendectomy: a retrospective cohort study assessing outcomes and cost-effectiveness. 2016; 11(1): 1-6.

10. Akporiaye ET, Aminoff MJ, Basbaum AI, Benowitz NL, Berkowitz BA, Bikle DD, et al. Bertram G. Katzung, MD, PhD.

11. Clark MA, Finkel R, Rey JA, Whalen K. Lippincott's illustrated reviews: pharmacology: Wolters Kluwer Health/Lippincott Williams & Wilkins; 2012.

12. Kain ZN, Fitch JC, Kirsch JR, Mets B, Pearl RGJA. Future of anesthesiology is perioperative medicine: a call for action. 2015; 122(6): 1192-5.

13. Brown EN, Pavone KJ, Naranjo MJA, analgesia. Multimodal general anesthesia: theory and practice. 2018; 127(5): 1246.

14. Verlinde M, Hollmann MW, Stevens MF, Hermanns H, Werdehausen R, Lirk PJIjoms. Local anesthetic-induced neurotoxicity. 2016; 17(3): 339.

15. Tao K-m, Sokha S, Yuan H-bJBhSr. The challenge of safe anesthesia in developing countries: defining the problems in a medical center in Cambodia. 2020; 20(1): 1-10.

16. Braz LG, Braz DG, Cruz DSd, Fernandes LA, Módolo NSP, Braz JRCJC. Mortality in anesthesia: a

systematic review. 2009; 64(10): 999-1006.

17. Tennant I, Augier R, Crawford-Sykes A, Ferron-Boothe D, Meeks-Aitken N, Jones K, et al. Minor postoperative complications related to anesthesia in elective gynecological and orthopedic surgical patients at a teaching hospital in Kingston, Jamaica. 2012; 62(2): 188-98.

18. Robinson DH, Toledo AHJJoIS. Historical development of modern anesthesia. 2012; 25(3): 141-9.

19. Barash PG. Clinical anesthesia: Lippincott Williams & Wilkins; 2009.

20. Ferguson C, Araújo D, Faulk L, Gou Y, Hamelers A, Huang Z, et al. Europe PMC in 2020. 2021; 49(D1): D1507-D14.

21. Gottschalk A, Van Aken H, Zenz M, Standl TJDÄI. Is anesthesia dangerous? 2011; 108(27): 469.

22. Lienhart A, Auroy Y, Pequignot F, Benhamou D, Warszawski J, Bovet M, et al. Survey of anesthesia-related mortality in France. 2006; 105(6): 1087-97.

23. Maldonado NJEmp. Evidence-based management of suspected appendicitis in the emergency department. 2011; 2.

24. Suh YJ, Jeong S-Y, Park KJ, Park J-G, Kang S-B, Kim D-W, et al. Comparison of surgical-site infection between open and laparoscopic appendectomy. 2012; 82(1): 35.

25. Khalil J, Muqim R, Rafique M, Khan MJSjogojotSGA. Laparoscopic versus open appendectomy: a comparison of primary outcome measures. 2011; 17(4): 236.

26. Rasmussen T, Fonnes S, Rosenberg JJSJoS. Long-term complications of appendectomy: a systematic review. 2018; 107(3): 189-96.

27. Chen C-C, Ting C-T, Tsai M-J, Hsu W-C, Chen P-C, Lee M-D, et al. Appendectomy timing: Will delayed surgery increase the complications? 2015; 78(7): 395-9.

28. Paquette IM, Zuckerman R, Finlayson SRJAos. Perforated appendicitis among rural and urban patients: implications of access to care. 2011; 253(3): 534-8.

29. Humes D, Simpson JJB. Acute appendicitis. 2006; 333(7567): 530-4.

30. Ball C, Kortbeek J, Kirkpatrick A, Mitchell PJSe. Laparoscopic appendectomy for complicated appendicitis: an evaluation of postoperative factors. 2004; 18(6): 969-73.

31. Shimoda M, Maruyama T, Nishida K, Suzuki K, Tago T, Shimazaki J, et al. Comparison of clinical outcome of laparoscopic versus open appendectomy, single center experience. 2018; 4(5): e00635.

32. Clark VL, Kruse JAJJ. Clinical methods: the history, physical, and laboratory examinations. 1990; 264(21): 2808-9.
33. Shaikh SI, Nagarekha D, Hegade G, Marutheesh MJA, essays, researches. Postoperative nausea and vomiting: A simple yet complex problem. 2016; 10(3): 388.
34. Smania MC, Piva JP, Garcia PCRJRdAMB. Dexmedetomidine in anesthesia of children submitted to videolaparoscopic appendectomy: a double-blind, randomized and placebo-controlled study. 2008; 54(4): 308-13.
35. Melesse DY, Denu ZA, Kassahun HG, Agegnehu AFJIJoSO. The incidence of early post-operative hypoxemia and its contributing factors among patients underwent operation under anesthesia at University of Gondar comprehensive and specialized referral hospital, Gondar, North West Ethiopia, 2018. A prospective observational study. 2020; 22: 38-46.
36. Mendonça FT, de Lucena MC, Quirino RS, Govêia CS, Guimarães GMNJBJoA. Risk factors for postoperative hypothermia in the post-anesthetic care unit: a prospective prognostic pilot study. 2019; 69(2): 122-30.