



ADDIS ABABA UNIVERSITY COLLEGE OF HEALTH SCIENCES SCHOOL OF MEDICINE
DEPARTMENT OF ANESTHESIA

INCIDENCE AND ASSOCIATED FACTORS OF POSTOPERATIVE NEGATIVE
BEHAVIORAL CHANGES AMONG PAEDIATRIC SURGICAL PATIENTS AFTER
GENERAL ANAESTHESIA AT SELECTED ADDIS ABABA PUBLIC HOSPITALS,
ETHIOPIA, 2024/2025: (A PROSPECTIVE COHORT STUDY).

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A RESEARCH THESIS SUBMITTED TO ADDIS ABABA UNIVERSITY COLLEGE OF
HEALTH SCIENCES, DEPARTMENT OF ANESTHESIA FOR PARTIAL FULFILLMENT OF
THE DEGREE OF MASTER OF SCIENCE (MSC) IN ANESTHESIA.

June, 2025 G.C.

ADDIS ABABA, ETHIOPIA

Addis Ababa University

College of Health Sciences

Department of Anaesthesia

A thesis submitted to Addis Ababa University, School of Medicine, and Department of Anaesthesia for the requirements of partial fulfilment of the degree of Masters of Science in Advanced Clinical Anaesthesia and Critical Care

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Thesis title Incidence and associated factors postoperative negative behavioral changes among pediatrics surgical patients after general anesthesia at selected Addis Ababa public hospitals, Ethiopia, 2025.

Duration of project From June 2024 to June 2025

Study area Tikur Anbessa Specialized Hospital and Yekatit 12 medical college hospital Addis Ababa, Ethiopia.

The total cost of research 24,283 Ethiopian birr

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Declaration

In partial fulfilment of the requirements for the Master in Anaesthesia, I, the undersigned, hereby declare this thesis is my original work.

I understand that plagiarism will not be accepted and all directly quoted material has been appropriately referenced

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Acknowledgment

I would like to express my gratitude to my advisors Mr. Wosenyelehi Admasu and Geresu gebeyehu for their assistance and comments which greatly improved this research.

I would also like to thank Addis Ababa University College of health sciences and department of Anesthesia

I am also immensely grateful to the Department of Anesthesia for providing this opportunity, which will help me develop the skill of conducting research that will enable me to conduct various breakthrough studies in my career to come.

Abstract

Introduction: Postoperative negative behavioral changes (PONBC) are common psychological disturbances occurring in children after surgery or hospitalization, affecting over 50% of pediatric patients undergoing general anesthesia.

Objective: This study aimed to determine the incidence and associated factors of postoperative negative behavioral changes among pediatric surgical patients receiving general anesthesia at selected governmental hospitals in Addis Ababa, Ethiopia, in 2025.

Methods: A prospective cohort study was conducted involving 248 pediatric patients aged 2 to 12 years undergoing surgery under general anesthesia at a selected Hospital. Data were collected through chart reviews, parent interviews, and telephone follow-ups. STATA version 14 was used for analysis. mean $\pm$ standard deviation were calculated for the continuous variable. Multivariable logistic regression was employed to identify independent predictor factors, with significance set at $p < 0.05$ and 95% confidence intervals.

Results: The incidence of Postoperative negative behavioral changes was 81.05% on postoperative day 3, declining to 19.23% by day 30. At 3rd day post operative day age (Adjusted Odds Ratio [AOR] = 0.80; 95% CI: 0.67–0.95, duration of surgery (AOR = 1.02; 95% CI: 1.01–1.04), crying during cannulation (AOR = 2.93; 95% CI: 1.19–7.19), cannulation performed in the ward (AOR = 4.15; 95% CI: 1.47–11.68), sadness before induction (AOR = 3.76; 95% CI: 1.33–10.63), and living with a single parent (AOR = 3.56; 95% CI: 1.29–9.80).

Conclusion: The incidence of postoperative negative behavioral changes is high in the early postoperative period but significantly decreases by one month after surgery. These findings highlight the importance of comprehensive perioperative psychological support, effective pain management, and targeted interventions for children at higher risk to improve postoperative outcomes.

Keywords: postoperative, negative behavioral change, pediatric, general anesthesia

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Acronyms

POMBs- Postoperative maladaptive behaviours

CAPD- Corneal Assessment of Paediatric Delirium

PHBQ- Post-Hospital Behaviour Questionnaire

PHBC- Post-Hospital Behaviour Change

PAB- Paediatric Anaesthesia Behaviour

PB-problematic behaviour

ASA- American Society of Anaesthesiologists

crSO₂- Cerebral regional oxygen saturation

HR- Heart rate

NPOBC- Negative postoperative behavioural change

VAS- Visual analogy scale

PACU-post-anaesthesia care unit

IPB- internalising problem behaviour

EPB-Externalising problem behaviour

FSD-Feeding sleeping disruption

SP-Somatic problem

Introduction

1.1. Background of the study

Hospitalization can have a significant psychological and emotional stress effect on both children and parents particularly when it involves undergoing anaesthesia for surgery, this psychological effect may subsequently develop changes in their behaviour (1).

It is important to note that negative behavioural change has been defined differently across studies and research groups which can impact overall interpretation of results. general findings suggest that roughly 24%-80% of children undergoing anaesthesia experience negative behavioural changes in the first several days after surgery. By 2 weeks, negative behaviours have been documented in 29%-54% of children. Whereas at 1 month the prevalence of behaviour change decrease to 16% of children.(2–4).

Postoperative negative behavioural changes (NPOBCs) in children are behavioural changes that can occur after surgery or hospitalization, and can include, Sleep and eating disorders, Separation anxiety, Temper tantrums, Aggression toward authorities, Nightmares, and Enuresis. It has been reported that Post-Hospitalisation Behaviour Change (PHBC) occurs in more than 50 % of children undergoing a general anaesthetic. The effect is usually short-lived (two to four weeks), however in 5-10% of children these behaviours can last up to 12 months (5). Apparently Young children who undergone repeated surgical procedures under general anaesthesia were at risk for subsequent behavioural and emotional disturbances(6).

The risk factors for developing PHBC include underlying anxiety in the child or parent, a previous bad hospital experience, emergence delirium and pre-school age associated with this multiple adverse outcomes associated with the child's anxiety include increased postoperative pain and delirium as well as postsurgical maladaptive behavioural changes Delayed behaviour change (known as post-hospitalisation behaviour change) is characterized by sleep and eating disorders, temper tantrums, nightmares, and anxiety(5,7–9).

During the 1950s, it was observed that some children had a change in their behaviour after a general anaesthetic which led to the development of the Post Hospitalization Behaviour Questionnaire (PHBQ) by Vernon and in 1960s based on commonly reported symptoms from

previous studies(10). Since its creation, the PHBQ has been considered the gold standard assessment in children from one month to 16 years of age among the academic medical community for assessing behavioural changes following surgery and/or hospitalisation (2,3).

Children face stress from several key sources: fear of injury or harm that could cause pain, disfigurement, or death; separation from parents and being around unfamiliar people without a trusted adult; fear of the unknown; uncertainty about what behaviours are acceptable; and feeling a loss of control and independence. Parents, in turn, experience stress from concerns about their child's safety, fearing injury or harm that could lead to pain or worse. They also struggle with changes in their parenting role, a lack of clear information, and worry about any changes in their child's behaviour, appearance, or emotional reactions after surgery(11).

To reduce the emotional stress associated with anaesthesia and surgery, anaesthetists must understand the psychological developmental milestones of childhood and anticipate situations that might be perceived as threatening by the child. This can often be achieved through preoperative education, a careful and considerate preoperative visit, avoidance of unpleasant surgical experiences and the use of preoperative sedation when other approaches are insufficient (6,12).

One of the main causes of distress in children is their lack of information or unfamiliarity with the hospital and surgical process. It seems logical that providing accurate and age-appropriate information would significantly help reduce this distress. However, offering information alone isn't straightforward and doesn't directly lead to lower levels of experienced distress. This might be because the effectiveness of the information depends on the child's coping strategy, which influences how they respond to the timing of the information given(13).

Meanwhile Individual, family and procedural variables can help identify the children at greatest risk of significant negative behaviour change. These include younger age, extended hospital stay, previous difficult anaesthesia experiences, anxious parents and children with two or more older siblings. Having a conversation with the anaesthetist was also associated with significant negative behaviour change. Even though the explanation for this association is unclear(1).

Those patients with lower anxiety recover more quickly and show fewer emotional and behavioral problems after discharge, while patients with heightened anxiety have an increased possibility of negative psychological consequences, such as continuing anxiety, depression, irritability and

aggressiveness. There are also medical consequences, including more frequent pain, worse scarring, and lowered defences to infection, increased consumption of sedatives, and social consequences such as indiscipline and lack of cooperation with health professionals. In addition, the trends in health care management aimed at reducing waiting lists for surgery may ignore, or relegate to second place, prevention of negative social and psychological consequences of anaesthesia, surgery and hospitalisation. These strategies may result in medium and long-term economic and social costs from the lack of such preventive measures(14).

1.2. Statement of the problem

A total of 1590 paediatric surgical procedures were performed during 2019 at Tikur Anbessa Specialized Hospital(15). Even though this many cases were done over the years there are no data on their postoperative behavioural change.

In some studies NPOBCs vary greatly from 22.0 to 80.4% owing to the length of hospital stay, complexity of the surgery, and duration of anaesthesia, More importantly, postoperative pain is the most critical risk factor for NPOBCs(16).

Most of the current studies are done in a high-income county and most with a good clinical service setup also most of the studies a had a long study period and none was focused specifically on PONBC in Africa meanwhile in Ethiopia which has a diverse nation with a poor socioeconomic status, diverse cultural difference and a very low health care infrastructures has not been addressed so it were be hard to relate the finding results to Ethiopia.

Delirium which is one component of PONBC is about (39.6%) of paediatric patients who undergo surgery under general anaesthesia at Amhara Regional State Tertiary Hospitals by Corneal Assessment of Paediatric Delirium (CAPD) score ≥ 9 (17).

Postoperative negative behavioural changes (PONBC) can significantly impact a child's psychological and emotional well-being, causing distress such as fears, nightmares, and separation anxiety, especially after painful procedures. These issues harm self-esteem, limit coping with future procedures, and hinder daily activities like play, social interactions, and school performance. Chronic behaviour problems can further reduce participation in social and physical activities, affecting the child's development and independence. Postoperative pain can also impair

concentration, leading to poor academic performance, absenteeism, and difficulty reintegrating into school(18–21).

For families, PONBCs cause emotional stress, anxiety, and sometimes guilt, straining family relationships. Financially, extended care, therapy, medications, and lost income from caregiving add to the burden. Longer hospital stays or re-admissions due to behavioural complications increase costs. PHBC leads to increased general practitioner visits, parental time off work and reduced compliance with future episodes of health care which will be a significant problem for children and parents(18–21).

Many pediatrics patients visit hospital for a different reasons and from this reasons surgery is one of the major ones in Ethiopia, unlike adults children's have difficulty expressing their feelings to parents or care givers and sometimes nor do they have the language for it due to their age and rather express things with a body language and crying which makes me wander their post-operative behavior and hate to the family and health care professionals, which is under looked in fact ignored for this I decided to study there PONBC of this children even though it has been studied in other countries the degree of the incidence has never been studied in Ethiopia.

Healthcare providers face challenges in predicting and managing PONBCs due to factors like age, personality, and surgery complexity while balancing pain management with emotional care is difficult. Hospitals also face higher costs due to extended hospital stays, follow-ups, and the need for mental health support, and consultations with specialists, increasing the workload on healthcare professionals and potentially affecting care quality. There's a growing demand for specialized paediatric care addressing both physical and psychological recovery, but not all institutions have the resources to meet this need, leading to variability in care quality and outcomes(18–21).

1.3. Justification of the study

Children in Africa constitute approximately 40% of the total population compared to the global average of 25%, and consequently, children bear a larger proportional burden of the surgical disease (22).

While there is extensive research on paediatric surgery in Ethiopia, studies focusing on postoperative psychological and behavioural outcomes post-surgery remain sparse.

NPOBCs in children are well recognised among anaesthetists at a different countries have been studied for decades(16). It's important to point out that hospitals differ in regard to recommended practices in preparing a child for surgery and anaesthesia. Some have formal policies on some of these procedures, whereas others rely more on the clinical judgement of the attending health care professional, it is unclear whether children in Ethiopian hospitals experience significant postoperative behavioural changes, and whether hospital practices influence these outcomes.

Numerous studies have been conducted to explore the relationship between perioperative risk factors and behavioural change using different study methods but these studies have different population characteristics and could not represent the Ethiopian socio-economic, health sector facility and cultural beliefs. Since this study was not done previously in Ethiopia there is a limited knowledge also on the socio demographics and the children's surgical experience which have an effect on postoperative behavioural outcome. Some studies highlight specific risk factors in there on community as more significant, while others find them less impactful or influenced by additional variables.

This variability in findings makes it challenging to establish clear guidelines for preventing and managing behavioural changes in the perioperative period. Further research is needed to reconcile these discrepancies and provide a more comprehensive understanding, allowing healthcare teams to develop more effective, evidence-based protocols for patient care during surgery and recovery in our setup.

In general, this study is crucial since future adults are today's children and if the current rate of PONBC is not timely identified in Ethiopia then the risk factors could not be timely prevented and this were having a public health impact for both the current and long-term implication locally and nationally due to the long-term consequences of PONBC. this research will also guid us the areas and mode of care in paediatrics surgical care which has to be improve, the goal of this study is to determine the Incidence and associated factors of postoperative negative behavioural changes in paediatric patients' awareness and prevention precaution guidance in the context of Addis Ababa selected governmental hospitals, Ethiopia.

This study aims to guide parents, anaesthesia providers, PACU caregivers, healthcare institutions, ward nurses, and other stakeholders in creating a good environment that is most likely to minimise or prevent NPOBC. Also, at the end of the conclusion of this thesis, it can be used as a reference

baseline for further countrywide study since the ultimate goal of the study is improving postoperative care by identifying preventable factors. Anaesthetists play a crucial role in preparing and caring for children before and after anaesthesia, ensuring their well-being throughout the process.

2. Literature review

2.1. Incidence of postoperative negative behavioural changes

In a descriptive study involving direct observation and self-report questionnaires done at the University of California (2006-2008) using the Post-Hospital Behaviour Questionnaire, San Francisco on 131 parents and their children (aged 2–12years) 93% of children had pain and 73% exhibited PB on day 2 after discharge. The incidence of pain and PB decreased over time, but 25% of children still had pain and 32% PB at week 4. Factors associated with PB were child's previous pain experience, parent and child anxiety and parent's level of education(19).

In another prospective, double-blind, randomized controlled study conducted in China on 90 patients scheduled for tonsillectomy in the year (2018) The incidence of NPOBCs in Group receiving dexmedetomidine 0.5 µg/kg was significantly lower at 1 and 7 days after discharge (33.3% vs 60.0%, $P=0.011$ and 24.4% vs 46.7%, $P=0.028$ respectively) than it was in Group volume-matched normal saline, but no significant difference was found at the 30th day(23).

A prospective observational study conducted at the University Clinic Hospital of Valladolid, Spain over 12 months between 2014 and 2015 on 198 children aged 2-12 years old scheduled for noncardiac procedures under general anaesthesia. The incidence of NPOBC on day 7 was 38.8% (77/198), Logistic regression analysis revealed that with every 1% reduction of $crSO_2$ from the baseline value, the odds of developing NPOBC were 1.199 higher(24).

In a prospective cohort study in 2014 at Robert Debre University Hospital, Paris, France, fifty-six patients were recruited from 3 to 18 years of age. 27 patients in the A family centered preoperative preparation workshop group were compared to 26 in the comparison group, a Significant differences were demonstrated between groups for POMB intensity (PHBQ score 2[0; 9] vs 5[0; 10], $P=0.008$) and incidence (PHBQ score >6: 3.6% vs 35.7% $P=0.003$)(25).

In another prospective observational study conducted at the National Centre for Children's Health, Beijing Children's Hospital, China (2023), on 192 children aged 2 ~ 12 who underwent elective surgery under general anaesthesia, 44.8% (86/192 patients) of the children developed NPOBC on postoperative day 3 (26). A similar study done at Columbia University Medical Centre with 29 total tonsillectomy and 49 partial tonsillectomy patients. PMBCs were also more frequent in total

than partial tonsillectomy patients (76% versus 59% at 2–3 days; 28% versus 7% at 1–2 weeks)(27).

Children’s Hospital of Orange County (CHOC), California, USA a prospective observational cohort study conducted from 2022-2023 on children 2–12 years old who were admitted to a paediatric ED for a laceration repair and their caregivers, A total of 173 families enrolled in the study, post-discharge maladaptive behavioural changes were reported in 43.9% (n=69 of 144) of children. At 1week post-discharge, approximately 20% % (n=27 of 128) of children exhibited maladaptive behavioural changes and 10% (n=13 of 123) displayed behavioural changes 2 weeks post-discharge. The most reported maladaptive behavioural changes were ‘needs help doing things’, ‘upset when alone’, ‘has temper tantrums’ and ‘has trouble getting to sleep at night’, representing 17.0%, 14.8%, 13.3% and 12.1% of all behaviour change occurrences reported across all post-discharge days(28).

Participants of 260 consecutive children ages 2–12 with (ASA) physical status I or II scheduled for outpatient tonsillectomy and adenoidectomy under general anaesthesia at Yale-New Haven Children’s Hospital UAS in 2024, new onset Maladaptive behavioural changes were detected in 70.4% of children on postoperative day 1, 80.4% of children on postoperative day 2, 69.0% of children on postoperative day 3, 59.2% on postoperative day 7, and 29.8% children on postoperative day 14. Apathy /withdrawal was the most commonly reported behaviour change on postoperative days 1, 2, and 3. Separation anxiety was the most commonly reported behaviour change on postoperative days 7 and 14(29).

In 2004 Robyn et al at The Royal Children’s Hospital, Melbourne, Australian showed that, at day 3 postoperatively, 24% (95% CI: 21.0-26.4) of children had negative behavioural changes, whereas at day 30, the number decreased to 16%(95% CI: 13.3-18.2) This study involved children between 3 and 12 years old, with a total of 1027 subjects(1).

A prospective observational cohort study in China (2021) included 1,670 children undergoing painless gastroscopy. The incidence rates of NPOBCs were 14.13%, 4.55%, and 2.14% on the 1st, 14th, and 30th day after gastroscopy, respectively(16).

According to a qualitative study out of 57 cases in 2010 Thirty-eight children (67%) presented at least one negative change, with several presenting at least one IPB, one EPB, one FSD, or one SP

(respectively 24, 20, 18 and 20). Most children (n=31, 54%) presented with several symptoms simultaneously, with a maximum of 10 symptoms(30).

2.2. associated factors

A prospective observational study conducted in Beijing Children's Hospital, China demonstrated that the Paediatric Anaesthesia Behaviour (PAB) score (OR: 1.23, 95%CI: 1.14–1.33) cerebral desaturation (OR: 1.16, 95%CI: 1.02–1.32) and postoperative pain score (OR: 1.07, 95%CI: 1.02–1.13) were independent predictors for NPOBC on postoperative day 3 ($P < 0.05$). There were no significant statistical differences in age, gender, weight, operation time, or operation type between the two groups. Patients in the NPOBC group have a higher PAB score than the non-NPOBC group($P < 0.001$) (26).

In another research done on “predictors of postoperative maladaptive behaviour change in children” “Logistic regression analyses that controlled for pain severity identified several predictors of behaviour change: preexisting somatic and anxious /depressed problems predicted new onset postoperative general anxiety, $X^2 = 20.10$ $P = 0.010$, younger age predicted separation anxiety, $X^2 = 20.41$, $P < 0.01$ and inhibited temperament predicted postoperative sleep disturbance, $X^2 (2) = 9.19$, $P = 0.010$ (29).

In Kunming, China prospective observational cohort study, on risk factors for NPOBCs on the first day were female sex (OR 1.34, 95% CI 1.00–1.79) parental anxiety (OR 2.23,95% CI 1.75–3.12,) and severe anxiety in children (OR 2.83, 95% CI 1.96–4.07) The risk factors on the 14th day were parental anxiety (OR=3.71, 95% CI 2.19–6.29) a parental educational level above high school (OR 1.65,95% CI 1.00–2.70,) such parents tend to be more aware of risks and complications, leading to increased anxiety, overprotection, and heightened sensitivity to their child's recovery. These behaviours can raise the child's own stress levels and limit their ability to cope with postoperative experiences. and severe anxiety in children (OR=11.87, 95% CI 5.85–24.07) The risk factors on the 30th day were female sex (OR=2.99,95% CI 1.41–6.34) being an only child (OR=4.42,95% CI 2.18–8.95,) a parental educational level above high school (OR=2.66,95% CI 1.27 -5.56,) (16).

A prospective, mixed-methods study in London (2020) over Seventy-one parent surveys and 48 child surveys aims to explore the experiences of paediatric patients undergoing preoperative fasting. The mean preoperative fasting time for food was 11.7 hours (SD 4.4) and 6.9 hours (SD

5.0) for fluids. Fasting times were far in excess of the minimums recommended, negatively impacting patient experience with 34% reporting being hungry/very hungry and 19% thirsty/very thirsty. Most children's comments suggested that they coped well with the fasting; however, several children reported feelings of sadness and anxiety(31).

About 288 parents from the year 2018_2021 (English-speaking White, English-speaking Hispanic, Spanish-speaking Hispanic parents) of children undergoing outpatient elective surgery, underwent a prospective observational study, Spanish-speaking Hispanic (SSH) parents reported lower negative behavioural changes in their children compared to English-speaking White (ESW) parents (day 1: $P < 0.01$; day 3: $P < 0.001$; day 7: $P < 0.10$) There were no significant differences with respect to children's age [$F(2,203) = 0.07$, $P = 0.94$] or gender [$F(2,202) = 1.06$, $P = 0.35$] between the three groups. However, significant group differences emerged in parental years of education [$F(2,200) = 75.76$, $P < 0.001$]. Chi-square analysis also revealed no significant differences in the nature of the different surgical procedures between the three groups, The majority of all children underwent ENT procedures (65.9%), followed by orthopaedic (11.8%), urologic (6.8%), and general surgery (6.7%)(32).

This descriptive study conducted at three London hospitals with specialised children's surgical units on Parents of all children aged 2–12 years, Factors associated with increased PB following univariable analyses at week 2 were children 2–4 years of age (vs 5–12 years) (median PB (possible range 0–27) $p=0.023$, $n=118$), children who had experienced pain during their last medical procedure ($p=0.03$, $n=98$), more educated parents ($p=0.037$, $n=103$), overnight hospital stay ($p=0.009$, $n=118$) and parents who took additional time off work ($p=0.009$, $n=99$) (19).

A prospective observational study included a convenience sample of 173 children 2–12 years old undergoing laceration repair in a paediatric ED in Orange, California, USA Mild levels of pain (NRS2) were reported in 46.7% ($n=70$) of children on post-discharge day 1, 10.3% ($n=14$) on day 7 and 3.1% ($n=4$) on day 14. An extremity laceration ($p=0.029$), pre-procedural midazolam ($p=0.020$), longer length of stay($p=0.043$) and post-discharge pain on day 1 ($p<0.001$) were associated with incidence of maladaptive behavioural changes. Higher pain on post-discharge day 1 was the only variable independently associated with an increased likelihood of maladaptive behavioural change (OR=1.32(95% CI 1.08 to 1.61), $p=0.001$)) (28).

2.3. Conceptual framework

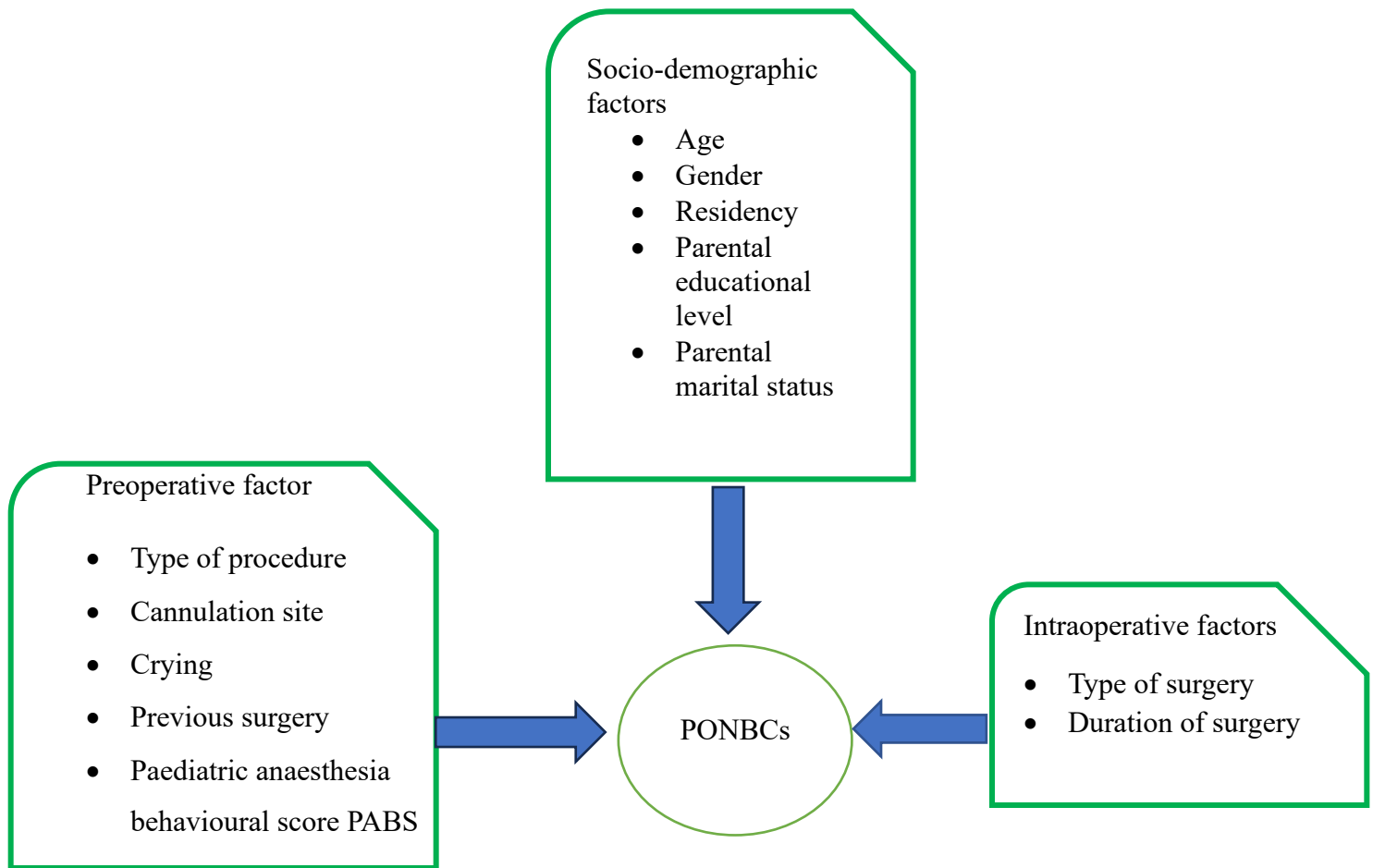


Figure 1 conceptual framework of factors associated with NPOBC

Objective

3.1. General objective

- To assess the Incidence and associated factors of postoperative negative behavioural changes in paediatric patients undergoing surgery under General anaesthesia in Tikur Anbessa Specialized Hospital, Yekatit 12 Medical College in Addis Ababa, Ethiopia, Ethiopia, 2024/ 2025 G.C

3.2. Specific objectives

- To determine the incidence of postoperative negative behavioural changes in paediatric surgical patients after general anaesthesia from January to April at Tikur Anbessa Specialized Hospital, Yekatit 12 Medical College in Addis Ababa, Ethiopia, 2025.
- To identify the associated factors of postoperative negative behavioural changes in paediatric surgical patients after general anaesthesia from January to April at Tikur Anbessa Specialized Hospital, Yekatit 12 Medical College, Addis Ababa, Ethiopia, 2025.

Methodology

4.1. Study area

The study was conducted at 2 selected Governmental referral teaching hospitals in Addis Ababa at Tikur Anbessa Specialized Hospital and Yekatit 12 medical college; are major paediatrics surgery site referred from all region of the country. Addis Ababa is the capital city of Ethiopia.

Tikur Anbessa Specialized Hospital which is also known as Black Lion Specialized hospital was established in 1972 E.C. It is the largest specialist hospital in Ethiopia and is now the main teaching hospital for clinical and preclinical training of many disciplines. Many health professionals from various disciplines staff the hospital. It has a total of 800 Beds and has about 17 operation theatres.

Yekatit 12 medical college which was established in 1923 EC is one of the specialized teaching hospitals located in Addis Ababa, it is serving more than 5 million people in the catchment area, it has 9 departments with 6 units and has more than 260 beds.

4.2. Study design and study period

A prospective cohort study was conducted from January 1 to April 30, 2024-2025.

4.3. Source and Study Population

4.3.1 Source population

All paediatric surgical patients who were undergo surgery under general anaesthesia at TASH and Yekatit 12- medical college Addis Ababa, Ethiopia, 2025.

4.3.2 Study population

All paediatric patients aged 2-12 years old who undergo General anaesthesia from January 01/2025 to march 30/2025 at TASH and Yekatit 12- medical college Addis Ababa, Ethiopia, 2025.

4.4. Eligibility criteria

4.4.1. Inclusion criteria

All paediatric patients aged 2-12 years who underwent general anaesthesia from January 1, 2025, to March 30, 2025, at TASH and Yekatit 12 Medical College, Addis Ababa, Ethiopia, 2025.

4.3.2. Exclusion criteria

- If the child had an anaesthesia exposure in the previous month to avoid confounding variables since it can have lingering effects on the child's cognitive and emotional state. These effects could complicate the interpretation of negative behavioural changes, making it difficult to distinguish whether those changes result from the most recent surgery or anaesthesia exposure from the previous procedure.
- Sedated patient and/or mechanically ventilated after surgery
- Patients who were transferred to other sites than PACU(1).
- Parents/ caregivers are unable to reliably complete the follow-up (e.g. due to literacy issues, language barriers, or unavailability).
- Children whose caregivers decline or fail to participate in follow-up assessments.
- Patients who underwent reoperation or those who had more than one operation in one month
- emergency surgery (23).

Is important to avoid confounding variables. Emergency surgeries often involve higher baseline anxiety and levels of stress, more severe illness or trauma, lack of psychological preparation, and variable perioperative care, all of which can independently influence behavioural outcomes. These factors make it difficult to isolate the effects of surgery on behaviour.
- children with pre-existing behavioural/psychiatric conditions and/or significant neurological disability (33).
- Patients who were admitted for more than 5 days in the hospital.

4.5. Study variables

4.5.1. Dependent variable

- Postoperative negative behavioural change

4.5.2. Independent variables

- Socio-demographic variables:
 - age,
 - sex,
 - Residence
 - Marital status
 - Parental educational level
- Anaesthetic-related variables:
 - Cannulation site
 - Cried while being cannulated
- Surgical related:
 - type of surgery,
 - duration of surgery,

4.6. Sample size determination

Since no study found similar sociodemographic and clinical characteristics to this study, a proportion of the incidence of PONB, assuming 50 % were used. For the sample size calculation, a single proportion formula with a 95% level of significance, 5% margin of error, and 5% for incomplete or contingency data were used; therefore, the total sample size was.

$$n = (Z \alpha/2)^2 \times p \times q / d^2$$

$$= (1.96)^2 \times 0.5 \times 0.5 / (0.05)^2$$

$$= 384, 5\% \text{ for loss to follow-up added}$$

$$= 384 + 5/100 = 384 + 38$$

=422

Where:

n= sample size, Z= desired 95% confidence, Z=1.96.

p = proportion of incidence of PONB assuming

q =1-p = 1-0.5= 0.5

d = Margin error (5%)

since the population size is less than 10,000 and the calculated sample size is larger than 5% of the target population the correction formula was used

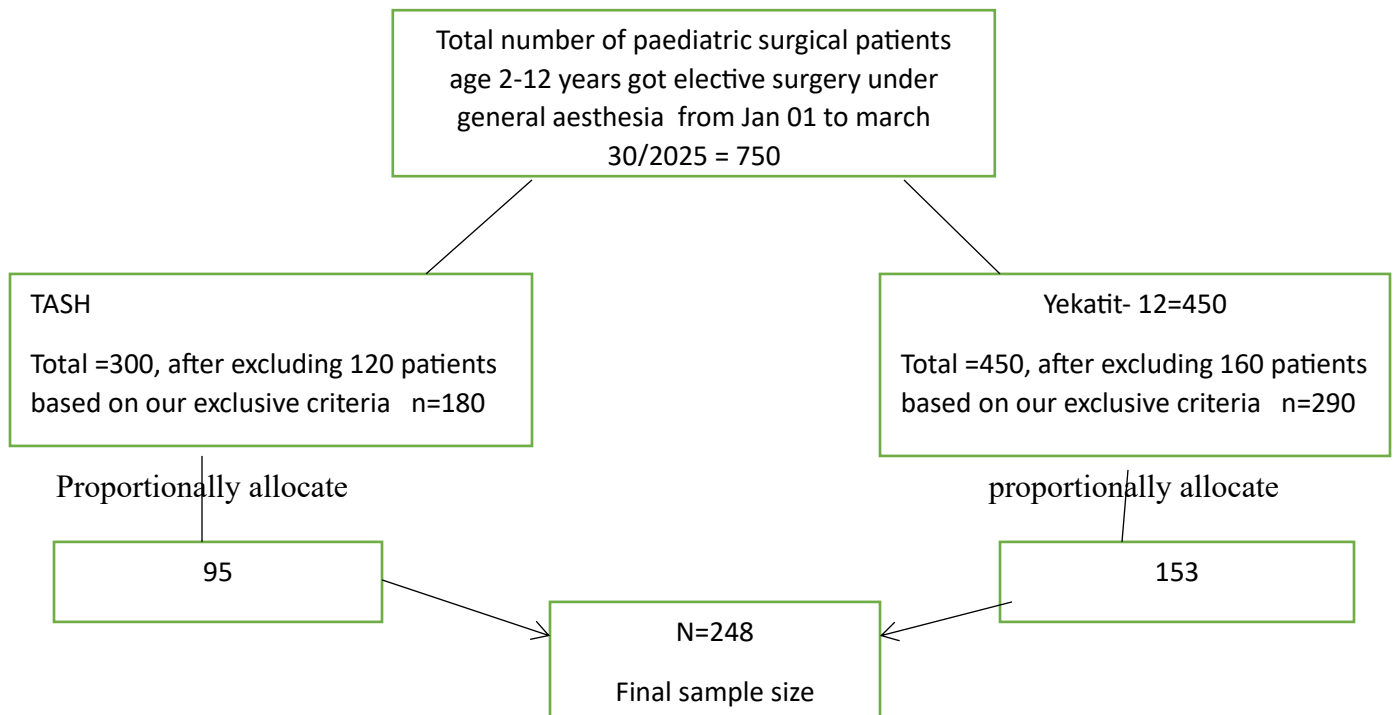
Where:

- n_0 = initial sample size (before correction), which is 422.
- N = population size, which is 600

$n = n_0 / 1 + (n_0 - 1) / N$, $n = 422 / 1 + (422 - 1) / 600$ $n = 248$

4.7. Sampling technique and procedure

All elective paediatrics surgery cases between the age of 2-12 years of age who underwent surgery under general anaesthesia at two hospital (TASH and Yekatit -12 hospital) from January 1 to March 30 2025 were recorded from elective surgery log-book. Then select the required sample size from each hospital proportionally by using a systematic random sampling technique.



4.8. Methods of data collection

Data were collected from 248 selected paediatric surgical patients. The data were collected using paper based questionnaire using Post Hospital Behaviour Questionnaire (PHBQ) and The Paediatrics Anaesthesia Behaviour (PAB) scale were adapted from the international measurement scale. And other socio demographic and clinical variables also added based on the existing literatures and my clinical experience.

The data were collected by anaesthesia professionals, 2 BSc anaesthetists as data collector, and 1-Msc anaesthetist as supervisor. To ensure the quality of the questionnaire, a pre-test was done on 5% (12) at St. Paulo's Hospital Millennium College on patients who were not included in the main study. The data were collected using both chart review and parents/caregivers interviewed using phone follow-up

To minimise inter-observer variability standardized training for all data collectors uniformly using clear protocols, practice sessions, and guidelines were given by the researcher also Provide precise operational definitions and decision-making aids for consistent data interpretation while ongoing feedback were offered and quality checks throughout the study. Finally, reliability testing tool Cohen's kappa to measure inter-observer agreement were used.

4.8.1. Assessment of behavioural changes

As assessed with the absolute version of the Vernon Post Hospitalization Behaviour Questionnaire (PHBQ), behaviour change is the primary outcome of this study. Vernon developed the PHBQ in 1966, which lists 27 behaviour items(3). For each item, parents are asked to compare their child's behaviour before hospitalization to their current behaviour (post-hospitalization) on a Likert-type scale using the following five response options: much less than before (1), less than before (2), same as before (3), more than before (4), and much more than before (5). Parents were asked to complete the questionnaire 3rd day and 30th days post discharge.

Results were be reported as more PB (scores 4 or 5), less PB (scores 1 or 2) or no change in PB (score 3), and NPOBC if the result is more than 7.

More PB (scores 4 or 5): This indicates a significant rise in postoperative negative behavioural changes. Patients with a score of 4 or 5 show a clear worsening in behaviour compared to their pre-surgery baseline, which may include behaviours such as heightened anxiety, aggression, or mood swings.

Less PB (scores 1 or 2): This indicates an improvement or reduction in negative behaviours after surgery. A score of 1 or 2 suggests that the child is exhibiting fewer negative behaviours compared to before the surgery, potentially due to relief from medical issues or effective postoperative care.

No Change in PB (score 3): A score of 3 indicates no significant change in the child's behaviour after surgery. The child's postoperative behaviour remains stable, showing neither improvement nor deterioration compared to the pre-surgery baseline.

NPOBC (Negative Postoperative Behavioural Change, more than 7): This refers to a composite score or threshold that indicates a severe or significant overall negative postoperative behavioural change. If the total score exceeds 7, it suggests the child has developed substantial negative behavioural changes after surgery, likely requiring attention or intervention.

data were collected by two trained anaesthetists and data completeness' were be checked by a 3rd trained anaesthetist daily on every patient's 3rd and 30th post-operative discharge day.

behaviour item could therefore show an improvement, deterioration or no change. The number of deteriorations were summed across the 27 items to determine the magnitude of behaviour change at days 3 and 30. For analysis a significant deterioration in behaviour were be defined as seven or more negative changes on the behaviour items [a similar classification was used as previous studies]. Parents were be instructed to indicate 'not applicable' if the behaviour was not applicable to their child, because of age, or if the specific question was not applicable for the. 'Not applicable' data were be treated as missing data. If data were missing for 21 or more item differences, then that behaviour change assessment were be excluded. (26)

4.8.2. Potential risk factors for behaviour change

Data on possible risk factors for behaviour change were collected. This included details of the child, their previous history, their parents, the procedure performed, their hospitalization and anaesthesia experience.

The parents were also be asked to retrospectively rate their child's anxiety at the time of separation for induction using a Paediatric Anaesthesia Behaviour Score at induction, from happy to mad.

4.9. Data quality assurance

Data collectors received comprehensive training on the study's objectives, the importance of data quality, and a thorough introduction to the assessment tools. After training, data were collected using a structured, pretested questionnaire, and each data collector were pre-tested to become familiar with the process. Supervisors were trained in quality control and fieldwork coordination. To refine procedures, pilot testing was followed the training, with the investigator reviewing questionnaires to ensure completeness and appropriateness. Regular team meetings and continuous communication were maintained to resolve issues promptly and ensure data consistency throughout.

4.10. Operational Definitions

Anxiety: Anxiety is a mental state characterized by an intense sense of tension, worry, or apprehension, relative to something adverse that might happen in the future, is a set of behavioural manifestations that can be divided into state and trait anxiety. State anxiety is a transitory emotional condition, while trait anxiety is a lifelong pattern of anxiety as a personality feature(34).

Delirium: Paediatric postoperative delirium is an acute brain dysfunction characterized by various clinical manifestations, including disturbances in awareness, attention, and disorientation(17).

Paediatric Anaesthesia Behaviour Score at induction: is newer and simpler measuring tool, paediatric anaesthesia behaviour (PAB), was developed by Beringer et al. This score relies on observations of children undergoing anaesthesia induction. It categorizes children based on their behaviour before induction into three groups: happy, sad, and angry(33).

Post-Hospital Behaviour Questionnaire - was designed for assessing children's posthospitalization and postoperative new-onset behavioural changes(3).

4.11. Data Management

All data collected including participant information treated with strict confidentiality. After data collected, the datasets were reviewed for completeness every day, gave refrainment and feedback to the data collector every morning. Then the collected data extracted to epi info 7 form and entered into SPSS version 22 once the data accurately entered, coded and cleaned, ready for to analysis

After the data obtained from chart review and questioner were coded and then entered, cleaned and edited to software STATA version 14. For continuous variables such as age, duration of surgery duration of aesthesia mean and standard deviation were calculated. Categorical variables were summarized using frequencies and percentages. The chi-square Test were used to observe the relationship between the categorical variables with a significant level of 5%, Bivariate logistic regression analysis was carried out to examine the predictors of the outcome variable. Variables with $p < 0.25$ in bivariate analysis were considered for inclusion in the multivariate logistic regression model. Data were expressed as odds ratio, mean $\pm$ SE and statistical significance was accepted at $P < 0.05$. Bar charts were used to depict the distribution of PONBC. Multicollinearity checks applying (via VIF=1.37) and the model fitness were check by the Hosmer-Lemeshow test it indicating the model was well fitted.

4.13. Data quality assurance

To ensure the quality of our data, the questionnaire had been adapted from existing literature and international behavioural measurement scales It had been pre-tested in a similar setup. The data collector and supervisor were clinically experienced anaesthetist, and data were collected from existing medical records and through phone interview of their parents or care givers. We attempt to reach participants with repeated call on different days using alternative phone numbers. This approach aims to improved data quality and reduce the non-response rate. Data were collected using paper based. After collection, the data were checked for completeness, code and clean, finally analysis and appropriate interpretation were performed.

4.14. Ethical consideration

Ethical clearance was obtained from Addis Ababa University (AAU) ethical review board. After receiving approval and a letter of collaboration from the Department of Anaesthesia, official support letter was written to responsible personnel for 2 hospitals to get permission for data collection. The informed written consent also obtained from each voluntary participant in the study after giving full information about the use and importance of conducting the study.

4.15. Dissemination of the result

After the finalization of the study the result will be submitted to TASH and school of anesthesia. Efforts were be done to publish the findings of the study and disseminated through different journals and scientific publications. The findings will further be disseminated to administrative bodies of the hospital and policy makers at national level through presentations and discussions.

Result

5.1. Socio-demographic characteristics of paediatric surgical patients

A total of 248 paediatric patients from age of 2 to 12 were included in this study, the mean age of 6.09, $SD \pm 0.168$, of them 140 (56.45%) patients were male 176 (70.97%) lives in Addis Ababa, 201 (81.05%) parents were educated above grade 10,(32) and 95 (38.31%) of patients live with single partners (Table 1).

Table 1 Socio-demographic characteristics of pediatric surgical patients at a selected referral hospital in Addis Ababa, Ethiopia 2025, n=248

Variable	Category	Frequency	Percentage
Sex	Male	140	56.45
	Female	108	43.55
Residency	In AA	176	70.97
	Out of AA	72	29.03
Educational status	<10	47	18.95
	>10	201	81.05
Marital status	Both	112	45.16
	Single	95	38.31
	Other	41	16.53
Age	Mean=6.09 SD ± 0.168 , CI= (5.76, 6.42)		

5.2. Surgical and anaesthesia-related characteristics of paediatric surgical patients

A total of 248 pediatric surgical patients were included in this study. Of these, 40 (16.12%) patients were lost to follow-up and excluded from the 30-day analysis. Among the 248 patients included in the 3rd day post-operative analysis, 68 (28.63%) had a history of previous surgery, 40 (16.13%) were cannulated in the operating room (OR), 177 (28.63%) were crying while being cannulated, and 110 (44.35%) were sad before induction. The mean duration of surgery was 91.69 minutes, $SD \pm 3.66$ (Table 2).

Table 2 Surgical and anesthesia-related characteristics of pediatric surgical patients at a selected referral hospital in Addis Ababa, Ethiopia, 2025. n=248

Variable	Category	Frequency	Percentage
Cannulation site	OR	40	16.13
	Ward	208	83.87
Crying	No	71	28.63
	Yes	177	71.37
Previous surgery	No	180	72.58
	Yes	68	27.42
Specialty	ENT	103	41.51
	Urology	67	27.82
	Orthopedics	27	10.89
	General	35	14.11
	Other	16	6.45
PABS	Happy	55	22.18
	Sad	110	44.35
	Mad	83	33.47
Duration of surgery	Mean=91.69 minutes, SD±3.66, (84.47, 98.91)		

5.3. Incidence of postoperative negative behavioural changes among paediatric surgical patients

The incidence of postoperative negative behavior in pediatric surgical patients after general anesthesia on the 3rd post-discharge day was 81.05% (201) among 248 patients. And the incidence of negative behavior at 30 post-discharge days was 19.23%; 208 patients were included in the analysis; 40 (16.13%) were non-responders after repeated phone calls, and we excluded them from the 30-day analysis (Table 3 and Fig 2).

Table 3. The incidence of PONB at the 3rd and 30th day of post-discharge day at selected Addis Ababa public hospitals, Ethiopia, 2024/2025:

PONBC	3 rd day, n=248		30 th day, n=208	
	Frequency	Percentage	Frequency	Percentage
Yes (≥ 7)	201	81.05	40	19.23
No (< 7)	47	18.95	168	80.77

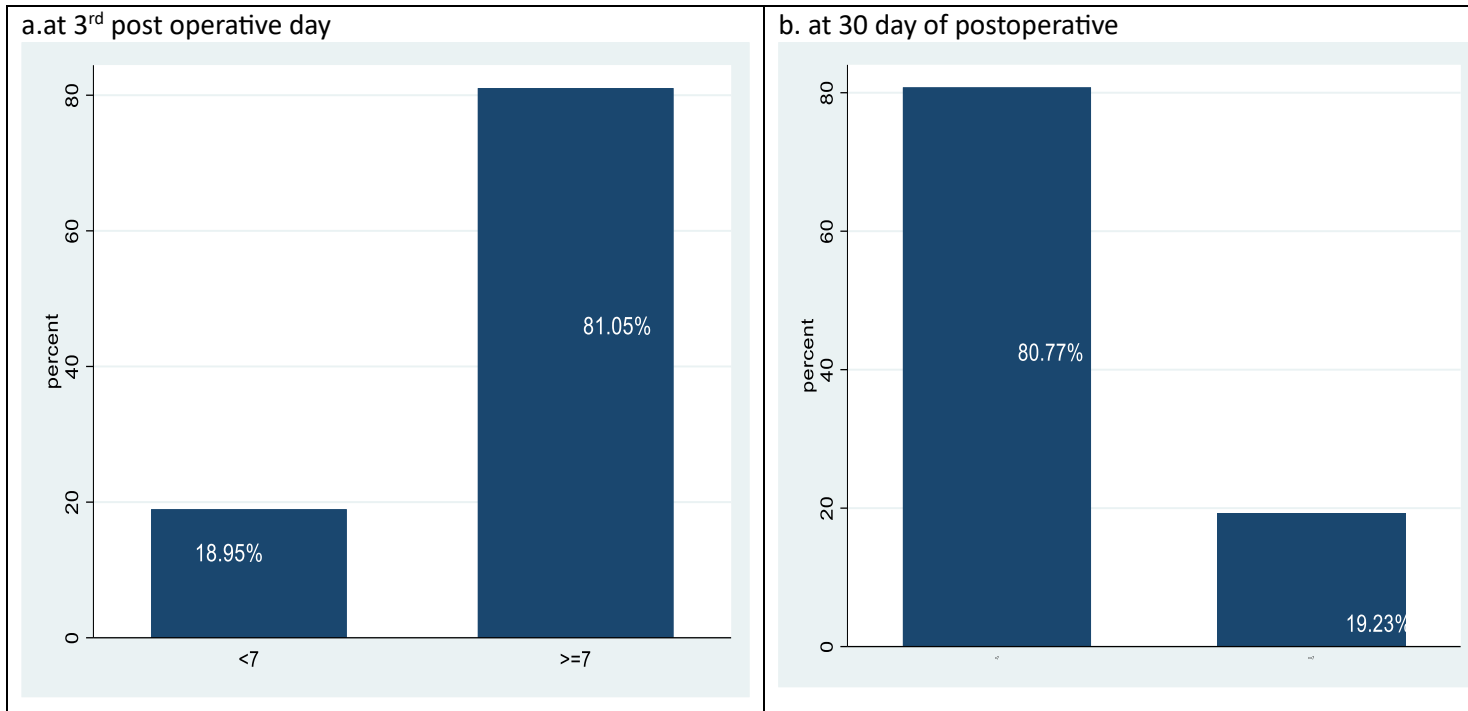


Figure 2 Bar graph indicates the incidence of post-operative negative behaviour at the 3rd and 30th day in paediatric surgical patients in a selected government hospital in Addis Ababa, Ethiopia, 2025

5.4 Predictor factors for postoperative negative behavioural changes in paediatric surgical patients

To identify the predictor factors of post-surgery negative behavioral change in pediatric surgical patients, the sociodemographic variable, surgical and anesthesia-related variables were analyzed first in a binary logistic regression model, and the variable p-value <0.25 was then analyzed in a multivariate logistic regression model (Table 4).

Table 4 Bivariate logistic regression for surgical and anaesthesia factors associated with 3rd day PONBCs among pediatric surgical patients at selected Addis Ababa public hospitals, Ethiopia, 2025, n=248

Variable	Category	PONBCs At 3 days			Bivariate logistic model	
		Yes (>=7)	No (<7)	Chi 2 and p-value	COR 95% CI	Pvalue
Cannulation site	OR	23	17	17.21, <0.001	Ref	
	Ward	178	30		4.38 (2.09, 9.16)	0.000*
Crying	No	42	29	31.04, <0.001	Ref	
	Yes	159	18		6.09 (3.09, 12.03)	0.000*

Previous surgery	No	140	40	4.57, 0.033	Ref	
	Yes	61	7		2.48 (1.05, 5.86)	0.037*
Specialty	ENT	72	31	14.67, <0.001	Ref	
	Urology	60	7		3.69 (1.51, 8.97)	0.004*
	Orthopedics	23	4		2.47 (0.79, 7.75)	0.120*
	General	32	3		4.59 (1.30, 16.12)	0.170*
	Other	14	2		3.01 (0.64, 14.06)	0.160*
PABS	Happy	29	26	36.90, <0.001	Ref	
	Sad	98	12		7.32 (3.29, 16.29)	0.000*
	Mad	78	9		7.27 (3.08, 17.61)	0.000*
Marital status	Both	83	29	6.96, 0.031	Ref	
	Single	84	11		2.66 (1.25, 5.69)	0.011*
	Other	34	7		1.69 (0.67, 4.24)	0.258
Education	<10		14	1.87, 0.171	Ref	
	>10	162	39		1.62 (0.76, 3.44)	0.204*
Residency	In AA	140	33	0.15, 0.699	Ref	
	Out of AA	55	20		1.24 (0.60, 2.55)	0.558
Sex	Female	92	16	2.13, 0.14	Ref	
	Male	104	31		0.61 (0.31, 1.18)	0.147*
Age Mean=6.09 SD $\pm$ 0.168, CI= (5.76, 6.42)					0.67 (0.59, 0.77)	0.000*
Surgery duration Mean=91.69 minute, SD $\pm$ 3.66,					1.02 (1.01, 1.03)	0.000*

N.B. * indicates the variables with p-value<0.25, which are included in the Multivariate regression model, COR=crude odds ratio, Ref=reference

The multivariate logistics regression model was used to identify six independently predicted variables on the incidence of PONBC at the 3rd post-operative day. When the age of patients increased by one year the incidence of PONBC were decrease by 20% with (AOR=0.80,95% CI: 0.70,0.99) indicates the early age child's had increased risk than the elder age child were protective to develop PONBCs, as length of surgery increased by 1 minute the incidence of PONBC also increased by 2% with (AOR= 1.02, 95% CI:1.01,1.04) meaning as the duration of surgery increase the risk higher, patient cry while cannulation increase by 2.92 times than not cry with (AOR= 2.92, 95% CI (1.19, 7.19), and cannulation at ward increase by 4.15 times than cannulated in OR (AOR=4.15, 95% CI (1.47, 11.68), sadness before induction also increased by 3.76 times than happiest before induction with (AOR=3.76, 95% CI: 1.33, 10.63), and also patents live with single parent increase the PONBCs by 3.56 than who live with both parents with (AOR=3.56, 95% CI: 1.29, 9.80) (Table 5).

Table 5 Multivariate logistics regression model for surgical and anaesthesia-related factors of paediatric surgical patients after the 3rd day of PONBS, at a selected hospital in Addis Ababa, Ethiopia, 2025, n=248

Variable	Category	PONBCs		Multivariate logistics	
		At 3 days		COR 95% CI	P-value
		Yes (≥ 7)	No (< 7)		
Cannulation site	OR	23	17	Ref	
	Ward	178	30	4.15 (1.47, 11.68)	0.007*
Crying	No	42	29	Ref	
	Yes	159	18	2.92 (1.19, 7.19)	0.019*
Previous surgery	No	140	40	Ref	
	Yes	61	7	2.75 (0.89, 8.54)	0.079
Specialty	ENT	72	31	Ref	
	Urology	60	7	1.09 (0.33, 3.55)	0.878
	Orthopedics	23	4	5.52 (1.30, 23.42)	0.020
	General	32	3	1.21 (0.26, 5.59)	0.803
	Other	14	2	1.84 (0.28, 11.76)	0.519
PABS	Happy	29	26	Ref	
	Sad	98	12	3.76(1.33, 10.63)	0.012*
	Mad	78	9	1.94 (0.57, 6.57)	0.286
Marital status	Both	83	29	Ref	
	Single	84	11	3.56 (1.29, 9.80)	0.014*
	Other	34	7	1.83 (0.55, 6.07)	0.38
Education	<10		14	Ref	
	>10	162	39	1.52 (0.50, 4.63)	0.453
Sex	Female	92	16	Ref	
	Male	104	31	0.95 (0.39, 2.29)	0.912
Age	Mean=6.09 SD $\pm$ 0.168, CI= (5.76, 6.42)			0.80 (0.67, 0.95)	0.014*
Surgery duration	Mean=91.69 minute, SD $\pm$ 3.66,			1.02 (1.01, 1.04)	0.010*

NB: AOR=Adjusted odd ratio, Ref= reference, * p-value <0.05 , statically significant variable

The fitness of the final multivariate logistics regression model test

The Hosmer-lemeshow test were apply to assess the goodness of fit for 10 groups of variables in this multivariate logistic regression model. The test presents (**Chi-2=12.45 with p-value=0.1321**) the p-value >0.05 , which is no significant difference between observed and expected frequency, indicating that the model fits well.

Discussion

This study assesses the incidence of post-operative negative behavioral changes (PONBCs) and its associated factors among pediatric surgical patients at selected government referral hospital in Addis Ababa. In this study, the incidence of PONBC at 3rd and 30th post-operative discharge days was 81.05% and 19.23%, respectively. The independent predictor factors that were identified using multivariate logistic regression at the 3rd post-operative discharge day were: younger age groups, crying while cannulation, cannulation in the ward, longer duration of surgery, Paediatric Anaesthesia Behavioural Score (PABS) sadness, and living with single parents, whether Mom or Dad.

In this study the incidence of PONBC decline progressively from 81.05% at 3rd day to 19.23% at 30th day, which aligns with findings from the University of California study, which reported 73% incidence at postoperative day 2, dropping to 32% at week 4 (19). The discrepancy in overall rates may be attributed to differences in healthcare settings, socioeconomic conditions.

In this study the higher PONBC incidence at 3rd and 30th days post-operative discharge day compared to the Royal Children's Hospital, Melbourne study 24% on day 3 and 16% on day 30 (1). This discrepancy could be due to population differences, geographic variability, and larger sample size in the Melbourne study. Additionally, differences in perioperative care protocols and parental psychological support may contribute to variations in postoperative recovery outcomes.

Our 3rd day incidence was also higher than another prospective observational study conducted at the National Centre for Children's Health, Beijing Children's Hospital, China, where 44.8% of the children developed NPOBC on postoperative day 3 (26). As well as a study conducted in Spain, on postoperative day 7, NPOBC was reported in 38.8% (24). The discrepancies were due to differences in population characteristics, sample size, and the variables used to measure them, as well as the long duration of the study.

This study found that as age increased by 1 year, the incidence of PONBC decreased by 20%, which indicates that early age is associated with an increased risk of developing PONBCs. This finding aligns with a study conducted in three London hospitals, which reported increased behavioural disturbances in children aged 2–4 years (19); as well as the Yale-New Haven Children's Hospital study, which found younger age predicted separation anxiety (29). Overall, the

data suggest that earlier aged children who are less sociable are at the highest risk of developing new-onset maladaptive behavioural changes than older. The decline in behavioural disturbances with increasing age is likely due to older children's greater ability to comprehend the hospital environment and communicate distress and favourable conditions effectively with parents and health care professionals.

In this study, the Paediatric Anaesthesia Behavioural Score (PABS) was strongly associated with increased PONBCs. If the patient was sad before induction, the risk of developing PONBCs increased 3.76 times than those who were happy. This aligns with findings from the Beijing Children's Hospital study, where higher PABS scores (OR: 1.23) correlated with increased behavioural disturbances(26). Furthermore, the London mixed-methods study reported that preoperative anxiety and sadness, often linked to prolonged fasting, significantly impacted patient experience (31). These findings suggest that emotional distress before surgery directly influences postoperative behaviour, warranting enhanced psychological support.

In this study, Children who cried while cannulation, underwent cannulation in the ward, or had a prior surgery exhibited a significantly higher incidence of PONBCs than those who did not, supported by findings from the University of California study, which associated previous pain experiences and anxiety with increased PONBCs (16,19). These preoperative factors may heighten stress responses, prolong maladaptive behaviours, and contribute to a more challenging postoperative recovery.

Conversely, in this study, as the surgery time increased, the PONBC incidence also increased, which is in contradiction with the findings in the Spanish-speaking Hispanic parent study, which reported no significant association(26,32). This discrepancy may be attributable to differences in case selection, healthcare accessibility, and sample size variation. Our study suggests that certain surgical procedures and its length of stay may induce higher stress levels, potentially affecting postoperative emotional adaptation.

According to our study single parent have increased risk of PONBCs by (OR 3.56) but in contrast with the finding Kunming Children's Hospital, China study (p=0.422) finding the variable were not significant (16).its discrepancy could be due to different study setting, and other parental anxiety were measured using the visual analogy scale (VAS) but in our setup children in single parent households find themselves retreating to socially they might have a tendency to dive into a

state of depression and loneliness which happens because of one parent is usually busy and has no time for kids as a result kids spend most time alone missing family and makes them vulnerable to post operative negative behavioural changes

Limitation and Strength of the study

7.1. Strength of the study

This study is strengthened by its multicentre design, conducted across major paediatric surgical sites in Addis Ababa's governmental referral and teaching hospitals, ensuring a diverse and representative sample. The prospective study design allows for real-time data collection, minimizing recall bias and providing a comprehensive understanding of postoperative negative behavioural changes across various surgical specialties. Additionally, the multi-method data collection approach, which includes chart review, partner interviews, and phone follow-ups, enhances data reliability and accuracy, ensuring robust and well-validated findings.

7.2. Limitation of the study

Despite its strengths, this study has limitations. It lacks a qualitative component, which could have provided deeper insights into the psychological and emotional experiences of paediatric surgical patients and their parents. Due to the vastness of the standard questioner, parents were exhausted answering the questioner, some important variables, such as pre-existing psychiatric conditions, other comorbidities, and ongoing treatments, were not included, which may have influenced postoperative behavioural outcomes. Socioeconomic factors, including healthcare system variations and parental socioeconomic status, were also not considered, which could impact recovery and behavioural responses. The short study period and small sample size contributed to a high non-response rate in the 30-day follow-up. And incomplete medical records were challenges in assessing critical factors, such as ASA classification, intraoperative and postoperative complications, which are essential for understanding patient risk profiles.

Conclusion and recommendation

8.1. Conclusion

This study provides valuable insights into the incidence and predictors of postoperative negative behavioral changes (PONBCs) in pediatric surgical patients, highlighting both short-term and long-term recovery patterns. The findings confirm that PONBCs are highly prevalent early in the postoperative period with a significant decline over time. Key predictors of PONBCs identified include younger age, crying before induction, ward cannulation, longer surgery duration, and PABS, all of which significantly influence postoperative emotional and behavioral adaptation.

Given the strong association between preoperative emotional distress and postoperative behavioral disturbances, the findings emphasize the need for comprehensive perioperative psychological support, optimized pain management, and targeted interventions for high-risk children.

8.2. Recommendation

For Healthcare Institutions:

- Implement child-friendly preoperative preparation programs to reduce anxiety.
- Optimize pain management and anaesthesia techniques to minimize distress.
- Strengthen postoperative follow-up for early intervention.

For Paediatric Surgeons & Anaesthesiologists

- Incorporate psychological support for anxious children.
- Improve perioperative communication with caregivers.

Parents & Caregivers

- Support emotional reassurance at home post-surgery.
- Engage in hospital-provided counselling to assist recovery.

Future Researchers

- Conduct longitudinal studies with a mixed method with qualitative study.
- Conduct the research on case-specific PONBCs
- Conduct the study in a large sample size

- Including unreached socioeconomic, psychological, clinical and health care system related factors.

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Appendix

10.1. Waiver of consent

**ADDIS ABABA UNIVERSITY
COLLEGE OF HEALTH SCIENCES
DEPARTMENT OF ANESTHESIA**

A Questionnaire to be filled by parents or caregivers of patients who were(are)

Admitted to the selected hospital for surgery in Addis Ababa

RESEARCH TOPIC: incidence and associated factors of postoperative negative behavioural changes in paediatric patients undergoing general anaesthesia at selected governmental hospitals

RESEARCHER: Hibist Zegeye

Dear Respondent, I would like to express my sincere appreciation for your time, and honest and prompt responses.

OBJECTIVE

This questionnaire is designed to collect data for assessing,” incidence and associated factors of postoperative negative behavioural changes in paediatrics patients undergoing general anaesthesia.” The information that you offer me with this questionnaire will be used as primary data to fulfil the partial requirements for the Master in anaesthesia from the department of anaesthesia at Addis Ababa. Your honest and patient response will help for better care of every child by improving the gaps identified by this research.

GENERAL INSTRUCTIONS

- *There is no need of writing your name.*
- *In all cases, where answers to options are available, please tick in the appropriate box.*
- *For questions that demand your opinion, please try to honestly describe your responses on the space provided.*
- *The questioner will be filled with a phone call and only take 10-15 minutes of your time and were be done on the 3rd and 30th postoperative day of your child.*

CONFIDENTIALITY

I want to assure you that this research is only for academic purposes authorized by the Anaesthesia Addis Ababa department. In this regard, no other person shall access the data collected. In any sort of report that I might publish, I would not include any information that would make it possible to identify any respondent.

Thank you in advance for your help.

By signing below, you are agreeing that you have been informed and understood the Participant Information Sheet questions about your participation in this study have been answered satisfactorily and you are taking part in this research study voluntarily.

Signature of the participant _____

I remain grateful to you for your kind cooperation.

hibu1616@gmail.com

October, 2024

Addis Ababa,

Ethiopia.

Questioner

DEMOGRAPHIC AND CLINICAL DATA OF THE CHILDREN

- 1, Children's gender Male [] Female []
- 2, Children's age.....
- 3, residence in Addis [] out of Addis []
- 4, Parental educational level <High school [] >High school []
- 5, Previous surgery YES [] NO []
- 6, Cannulation site ward [] OR []
- 7, Cried while being cannulated YES [] NO [] can't tell []

Chart review

1, Types of Surgical Specialty

- A. ENT
- B. Orthopaedics
- C. Urology
- D. General surgery
- E. Thoracic
- F. Ophthalmic
- G. Other procedure

2, Duration of surgery.....

3, Duration of anaesthesia

The Paediatric Anaesthesia Behaviour Score at induction

Score	Description of behaviour	
1	Happy	Calm and controlled. Compliant with induction
2	Sad	Tearful and/or withdrawn but compliant with induction
3	Mad	Loud vocal resistance (screaming or shouting) AND/OR Physical resistance to induction requiring physical restraint by staff and/or parents

Post-Hospitalization Behavioural Questionnaire to be filled on 3rd and 30th day postoperatively

No	Items	Score				
		1	2	3	4	5
1	Does your child make a fuss about going to bed at night?					
2	Does your child make a fuss about eating?					
3	Does your child spend time just sitting or lying and doing nothing?					
4	Does your child need a pacifier?					
5	Does your child seem to be afraid of leaving the house with you?					
6	Is your child uninterested in what goes on around him (or her)?					
7	Does your child wet the bed at night?					
8	Does your child bite his (or her) finger nails?					
9	Does your child get upset when you leave him (or her) alone for a few minutes?					
10	Does your child need a lot of help doing things?					
11	Is it difficult to get your child interested in doing things (like playing games, with toys, and so on?)					
12	Does your child seem to avoid or be afraid of new things?					
13	Does your child have difficulty making up his (or her) mind?					
14	Does your child have temper tantrums?					
15	Is it difficult to get your child to talk to you?					
16	Does your child suck his (or her) fingers or thumbs?					
17	Does your child seem to get upset when someone mentions doctors or hospitals?					
18	Does your child follow you everywhere around the house?					
19	Does your child spend time trying to get or hold your attention?					
20	Is your child afraid of the dark?					
21	Does your child have bad dreams at night or wake up and cry?					
22	Is your child irregular in his (or her) bowel movements?					
23	Does your child have trouble getting to sleep at night					

24	Does your child seem to be shy or afraid around strangers?					
25	Does your child have a poor appetite?					
26	Does your child tend to disobey you?					
27	Does your child break toys or other objects?					

1	2	3	4	5
much less than before	less than before	same as before	more than before	much more than before