COLLEGE OF MEDICINE AND HEALTH SCIENCE DEPARTMENT OF ANESTHESIA AND ANESTHESIOLOGY

INCIDENCE AND PREDICTORS OF POSTOPERATIVE PAIN IN PEDIATRIC PATIENTS UNDERWENT OPHTHALMOLOGICAL SURGERY AT HAWASSA UNIVERSITY COMPREHENSIVE SPECIALIZED HOSPITAL: A PROSPECTIVE COHORT STUDY IN 2024.

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MAY, 2024

HAWASSA, ETHIOPIA

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A THESIS TO BE SUBMITTED TO HAWASSA UNIVERSITY COLLEGE OF MEDICINE AND HEALTH SCIENCE, FACULTY OF MEDICAL SCIENCE AND DEPARTMENT OF ANESTHESIA AND ANESTHESIOLOGY IN PARTIAL FULFILLMENT FOR MASTER OF SCIENCE IN ADVANCED CLINICAL ANESTHESIA

MAY, 2024

HAWASSA, ETHIOPIA

APPROVAL SHEET-1

APPROVAL SHEET

This research proposal, titled "The incidence and predictors of postoperative pain in pediatric patients underwent ophthalmological surgery at Hawassa University Comprehensive Specialized Hospital in 2024," has been prepared and submitted by Alemlanchi Mebrat, an Msc anesthesia student, for partial fulfillment of a Master of Science (Msc) degree in advanced clinical anesthesia. The research was conducted under our supervision. Therefore, we recommend that the student has fulfilled the requirements and can now submit the thesis to the department.

Name of advisors	Signature	Date
1. Kurabachew Mengistu (Bsc, Msc, asst. prof)		14/9/16
2. Mengistu Yinges (Bsc, Msc in anesthesia)	Mengistu Y	14-09-16

APPROVAL SHEET-2

We, members of the board of examiners of the final open defense have read and examined the thesis entitled “Incidence and predictors of postoperative pain in pediatric patients underwent ophthalmological surgery at Hawassa University Comprehensive Specialized Hospital in 2024” prepared and submitted by Alemlanchi Mebrat Msc anesthesia student for partial fulfillment of a master of Science (Msc) degree in advanced clinical anesthesia. This is, therefore, to clarify that the thesis has been accepted in partial fulfillment of the requirement for the degree.

_____	_____	_____
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External examiner	Signature	Date
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SGS Approval	Signature	Date

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ABBREVIATIONS AND ACRONYMS

ASA: American society of anesthesiology

FLLAC: Face, leg, activity, crying, consolability

HUCSH: Hawassa University Comprehensive Specialized Hospital

MYPAS-SF: Modified Yale Preoperative Anxiety Scale- short form

NSAD: Non-steroidal anti-inflammatory drugs

POP: Postoperative pain

SPSS: Statistical package for social science

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ABSTRACT

Background: Postoperative pain is a type of acute pain that occurs after surgical procedures. Although there have been studies on the incidence, predictors, and management of postoperative pain in the pediatric population, there is insufficient data about ophthalmic surgical pediatric patients.

Objective: The objective of this study is to assess the incidence and predictors of postoperative pain among pediatric patients underwent ophthalmological surgery at Hawassa University Comprehensive Specialized Hospital in 2024.

Methods: A prospective cohort study was conducted on 130 participants aged 2 month to 14 years at Hawassa University Comprehensive Specialized Hospital from January 8 to April 8, 2024. Participants who underwent ophthalmological surgery were included using a consecutive sampling technique. Data was collected by using pretested questionnaires and analyzed using Statistical Package for the Social Sciences (SPSS) version 26. The result was summarized by using tables and figures. Logistic regression was used for the analysis technique to see the association of the independent variable and dependent variable. Variable with a p-value of 0.2 at bivariate analysis entered into multivariable analysis and p-value less than 0.05 in multivariable analysis was considered statistically significant.

Results: According to this study an overall incidence of postoperative pain in pediatric ophthalmic surgical patients was 69.2% within 24hr after surgical procedure. Age (AOR=3.672, 95% CI: 1.119-12.049), urgency of surgery (AOR=4.441, 95% CI: 1.317-14.975), anxiety (AOR=9.820, 95% CI: 3.348-28.807), and type of surgery (AOR=0.097, 95% CI: 0.010-0.961) were significantly associated with postoperative pain.

Conclusion and Recommendation: Based on our study finding, the incidence of pain in pediatric ophthalmic surgery was high compared with other related studies. This shows that, the problem needs attention and awareness should be created regarding the independent predictors. Therefore, Health care providers should target those predictors to minimize the incidence of postoperative pain.

Keywords: Pediatric, ophthalmologic, postoperative pain, incidence, predictors

CHAPTER ONE: INTRODUCTION

1.1Background

According to the International Association for the Study of Pain (IASP), pain is defined as ‘an unpleasant sensory and emotional experience associated with actual or potential tissue damage` (1). Postoperative pain is a form of acute pain that occurs as a result of surgical intervention, triggered by an inflammatory response and the activation of afferent neuronal cells; it is a common consequence and undertreated issue among the pediatric population (2, 3).

The gold standard pain assessment tool is self-report. However, it is difficult to apply self report pain assessment tools in children, since they are non-verbal (4). Therefore, Behavioral pain scales (FLACC scale) are recommended to assess postoperative pain in infants and children which are consisted of five categories, each scoring from 0 to 2, providing a total score ranging from 0 to 10. A score of 1 or above indicates the presence of pain, and a score of more than 3 points suggests the need for analgesics (5-7).

A few studies were conducted previously on the incidence and associated factors of postoperative pain after pediatric ophthalmic surgery. Those studies have concluded that postoperative pain in ophthalmic surgery and its predictors were often underestimated and neglected. Its risk is particularly high in cases involving preoperative pain, preoperative anxiety, and general anesthesia, specific types of surgery, longer surgical duration, female patients, and younger ages (8, 9).

There is a common misconception in ophthalmic surgery that postoperative pain is minimal or nonexistent due to the perception that it involves less trauma compared to other types of surgery (10). Although pediatric postoperative pain is often unavoidable, there are strategies to prevent and manage it. These strategies include the use of less invasive surgical techniques, regional anesthesia instead of general anesthesia, anesthetic adjuvant, patient and parental education and preparation before surgery to reduce anxiety and stress, and routine postoperative pain assessment using age-appropriate tools (11, 12).

Basic analgesia’s, such as paracetamol, NSAIDs, and topical local anesthetics, can effectively manage postoperative pain in children. Their use significantly reduces the need for opioids, which are typically reserved for the intraoperative and early postoperative periods, requiring

specialized personnel for continuous opioid infusion 24 hours a day (5, 13, 14). Multimodal analgesia should be continued into the postoperative period, with the addition of supplemental opioids if required(15).

Postoperative pain is associated with different adverse outcomes for both children and their families, For instance, it may cause infection, delay recovery, prolong hospital stay, increase the risk of readmission, prolonged opioid use and persistent pain and thereby increase healthcare costs and lead to patient dissatisfaction (5, 16).

Despite the wealth of studies into the predictors affecting POP among children's, there are limited data about the predictors affecting POP among ophthalmic children. Thus, the present study was conducted to address these gaps. The aim of the study was to determine the incidence of postoperative pain in pediatric patients following ophthalmic surgery and identify predictors independently associated with its development.

1.2 Statement of the Problem

Postoperative pain is one of the most prevalent complications following surgery and more than 47% of surgical patients endure postoperative discomfort worldwide which is substantially more common in developing countries when compared to developed countries(17).

Although not specifically focused on the ophthalmic pediatric population, a previous study conducted in Ethiopia on pediatric postoperative pain in 2020 found that 74.2% of children experienced mild to severe pain within the first 48 hours following surgery(18).

A study conducted by HJ Paik et al in Korea on measurement of acute pain after eye surgery in children showed that two-thirds of the children experienced pain equal to or greater than moderate to severe levels and approximately one-fifth of the subjects reported the most severe pain at 2 hours after surgery(19). Similarly, a study done in Canada on reducing postoperative pain in children undergoing strabismus surgery reports that incidence of moderate to severe post-operative pain was 47.3%(20).

In a retrospective study conducted by Lesin et al., significant gaps in pain management and perioperative care were identified among patients undergoing ophthalmic surgery; the study found that medical records lacked information regarding pain, with a high percentage of patients not receiving premedication or pain medication before, during, and after surgery and the majority of patients who received analgesia after surgery were administered only a single dose and analgesia was primarily provided on the day of surgery (21).

To prevent postoperative pain opioids are used. However, they cause respiratory depression, sedation, nausea and vomiting and thus may prolong stay in the hospital (22). Simple postoperative analgesia with paracetamol, NSAIDs, and topical local anaesthetic is usually sufficient and supplemental opioids required if the pain is sever(13).

Inadequate postoperative pain management can result in prolonged hospital stays, unfavourable patient outcomes, and the development of chronic or persistent postsurgical pain which may persist for up to 6-12 months after surgery (23).

1.3 Significance of study

Due to its less traumatic nature than other type of surgery, ophthalmological surgery is often thought to produce little to no postoperative pain. Consequently, postoperative pain following eye surgery has received limited attention and this may account for the lack of published studies on this title. This initiates me to conduct research on this title.

Even though some studies were done postoperative pain in pediatrics, the results and recommendations cannot be generalized for ophthalmic surgery. This highlights the need for systematically studied scientific knowledge about postoperative pain in ophthalmic pediatric patients.

According to certain research, ocular tissues are more sensitive to unpleasant stimuli, which could cause patients to experience excruciating postoperative pain. On the other hand, most anesthetics used in ocular procedures are short-acting and meant to hasten the patients' awakening from anesthesia, even though they may also make postoperative pain more common. Despite being more approachable, nurses might not be equipped to inquire about discomfort from patients who are not complaining.

It is crucial to investigate the major predictors independently associated with its development as well as evaluate the incidence in this specific context. Evaluate the incidence of postoperative pain will give a clear picture of its burden. Identifying, addressing and understanding predictors associated with postoperative pain which might help professionals to optimize perioperative management and improve the quality of intervention.

Furthermore, the findings of this study will serve as a valuable source of information for future researchers and contribute to increase the pain management practices at Hawassa University Comprehensive Specialized Hospital.

1.4. Research question

1. What is the incidence of postoperative pain in ophthalmic pediatric surgical patients that has underwent elective and emergency surgery?

2. What factors predict postoperative pain?

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

Postoperative pain in the ophthalmic pediatric population is an area that has often been overlooked. So, considering the ophthalmic pain and its predictors, negative consequences of untreated pain is important because understanding the predictors may help us to alleviate it, improve patient outcomes, and reduce medical costs (8).

2.2 Incidence of postoperative pain after pediatric ophthalmic surgery

Few studies have provided valuable insights into the incidence of postoperative pain in pediatric patients undergoing ophthalmic surgery.

A project conducted at a university-affiliated quaternary pediatric hospital aimed to reduce postoperative pain in children undergoing strabismus surgery founds that the baseline mean monthly incidence of moderate to severe postoperative pain was 47.3% (24).

HJ Paik et al conducted a study in Korea with 64 children who underwent eye surgery. The study revealed that approximately two-thirds of the children experienced moderate to severe pain with about one-fifth of the subjects reporting the most severe pain at 2 hours after surgery. Even at 4 hours and 8 hours post-surgery, 95.3% and 82.8% of the children, respectively, still complained of pain (19).

2.3 Predictors of postoperative pain after pediatric ophthalmic surgery

A prospective observational study conducted in France with a total of 106 subjects identified type of surgical interventions as a risk factor for the occurrence of postoperative pain in children (25). Additionally, a prospective observational cohort study conducted by Ye et al. in China involving 212 consecutive patients who underwent oculoplastic surgery reported that the type of surgery and anxiety were risk factors for postoperative pain (26).

A prospective study conducted by Lesin et al with 226 participants who underwent eye surgery at the University Hospital Split, Croatia found that surgery under general anesthesia and higher pain intensity before surgery were independent predictors of pain intensity (27).

A systematic review conducted on factors associated with postoperative pain and analgesic consumption in ophthalmic surgery reported that female sex, longer duration of surgical

procedure, type of surgery, and general anesthesia contributed to develop postoperative pain (28).

Yang MMH et al conducted a systematic review and meta-analysis on the preoperative predictors of poor acute postoperative pain control. These predictors included younger age (OR 1.18, 95% CI 1.05 to 1.32, n=14), female sex (OR 1.29, 95% CI 1.17 to 1.43, n=20), history of anxiety symptoms (OR 1.22, 95% CI 1.09 to 1.36, n=10), presence of preoperative pain (OR 1.21, 95% CI 1.10 to 1.32, n=13), and use of preoperative analgesia (OR 1.54, 95% CI 1.18 to 2.03, n=6)(29). A study done in South Africa reveled by Adriaan A et al demonstrated that patients undergoing emergency surgery are more likely to experience significant postoperative pain compared to elective surgery(30).

A study conducted in Nigeria revealed that patients with ASA classification of III and above have a higher tendency to develop postoperative pain. Additionally, age is another factor that has a relationship with the development of postoperative pain. Older patients are reported to experience less pain, have fewer complaints, and require fewer postoperative analgesics compared to younger individuals (31).

A longitudinal study conducted on 235 pediatric surgical patients in Ethiopia reported patients with preoperative pain [AOR] = 3.41, CI = 1.15, 10.00), preoperative anxiety (AOR = 2.28, CI = 1.219, 4.277), a longer duration of surgery (AOR = 6.62, CI = 1.90, 23.00) were developed postoperative pain. Furthermore, the study found that the use of multimodal analgesia contributed to a reduction in postoperative pain (AOR = 0.24; CI = 0.091, 0.652) (32).

A study done in New York on predictors for moderate to severe acute postoperative pain concludes that the use of preoperative analgesia, especially opioid therapy causes poor postoperative pain control (33-35). An institutional-based cross-sectional study was conducted in Ethiopia reported that female gender and preoperative pain had significant associations with postoperative pain ((36).

Another institution-based, cross-sectional follow-up study was also conducted in Ethiopia revealed that preoperative anxiety (AOR: 2.24, 95% CI: 1.02, 4.88) and a history of preoperative pain (AOR: 3.97, 95% CI: 1.55, 10.19) were significantly associated with postoperative pain.(37).

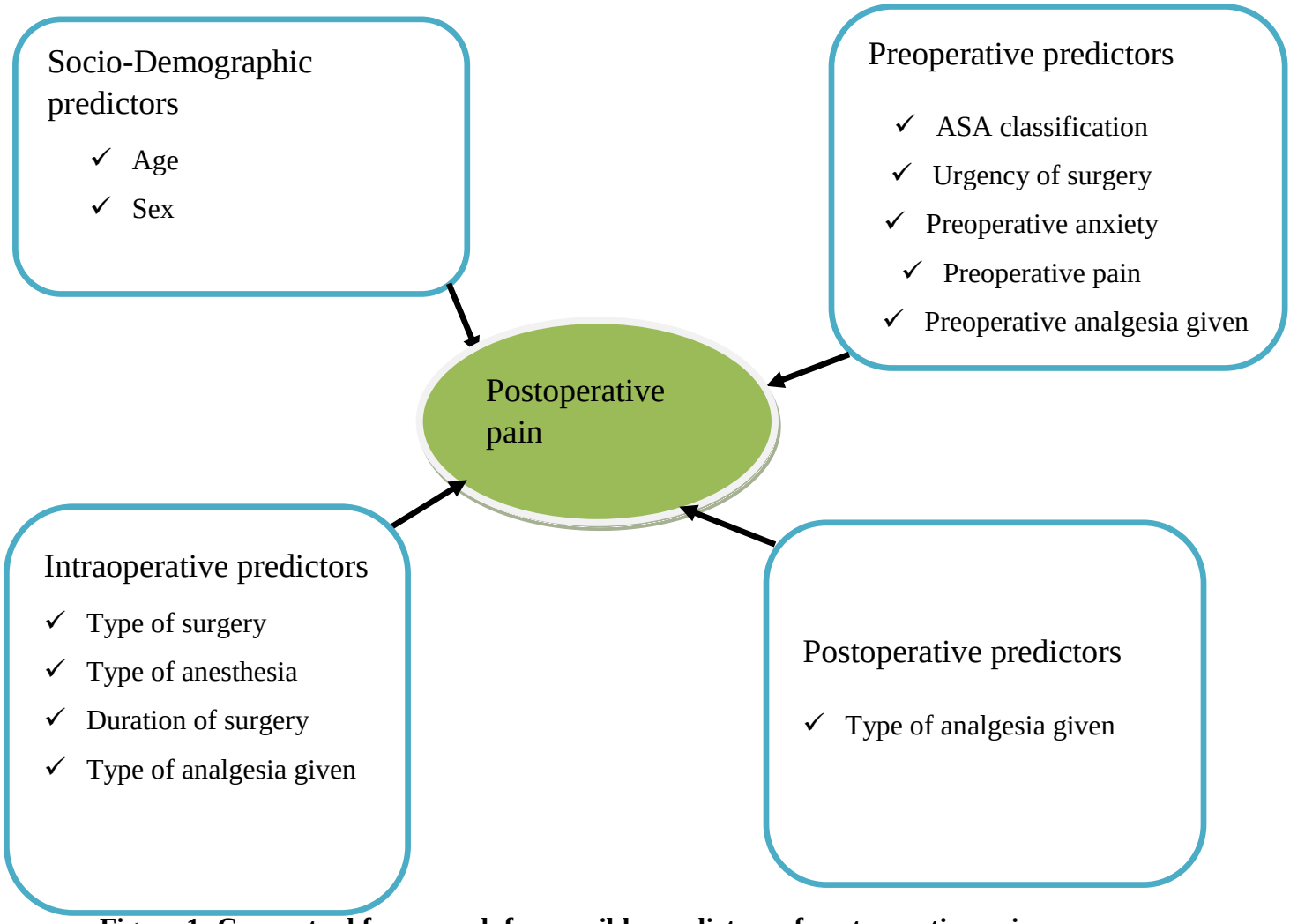

Figure 1: Conceptual framework for possible predictors of postoperative pain

CHAPTER THREE: OBJECTIVE

3.1 General objective

To assess the incidence and predictors of postoperative pain in pediatric patients underwent ophthalmological surgery at Hawassa University Comprehensive Specialized Hospital from January 8 to April 8, 2024.

3.2 Specific objective

1. To determine the incidence of postoperative pain in pediatric patients underwent ophthalmological surgery at Hawassa University Comprehensive Specialized Hospital in 2024.
2. To identify the predictors of postoperative pain in pediatric patients underwent ophthalmological surgery at Hawassa University Comprehensive Specialized Hospital in 2024.

CHAPTER FOUR: METHODOLOGY

4.1 Study area and study period

The study was conducted at Hawassa University Comprehensive Specialized Hospital from January 8 to April 8, 2024. Hawassa is a city in Ethiopia's set up in Sidama region, roughly 273 km from Addis Ababa. The city has 9 hospitals, seven of which are private and two of which are public. HUCSH serves as a teaching hospital for the College of Medicine and Health Sciences at Hawassa University and is one of the tertiary referral hospitals for the federal ministry of health. In its catchment area, the hospital serves 18 million people. It receives approximately 5000 outpatient and emergency visits per month and has a total of 400 beds and 11 operation rooms (38). Among those 11 operation rooms 2 of them are used for ophthalmic procedures, one room for adult ophthalmic surgical patients and the remaining one room is for pediatric patients.

4.2 Study design

Prospective cohort study

4.3 Population

4.3.1 Source population

Paediatric patients who were underwent ophthalmologic surgery at HUCSH.

4.3.2 Study population

All paediatric underwent for ophthalmologic surgery and fulfilled the inclusion criteria at HUCSH during the study period.

4.4 Inclusion and Exclusion Criteria

4.4.1 Inclusion criteria

All pediatric patients aged between 2 month and 14 years who underwent elective and emergency ophthalmological surgery.

4.4.2 Exclusion criteria

- Patients who have pre-existing cognitive dysfunction and critical ill patients
- Patients with chronic pain
- ASA> II

4.5 Study variable

4.5.1 Dependent variable

Postoperative pain

4.5.2 Independent variables

The independent variables included in this study were sex, age, ASA classification, urgency of surgery, preoperative anxiety, preoperative pain, history of preoperative analgesia, type of surgery, type of anesthesia, duration of surgery, type of intraoperative analgesia given, and postoperative analgesia.

4.6 Sample size and sampling technique

4.6.1 Sample size calculation

The sample size was calculated by using a single proportion formula with confidence interval of 95%, a margin of error of 0.05. There was no a similar study conducted previously on this title and study participants. Therefore, we have used population proportion (P) value =50%.

$n = \frac{z2p(1-p)}{e2}$ Where n is the sample size

z is the statistical parameter corresponding to the level of confidence

p is the expected incidence

e is maximum estimation error accepted.

By using this formula our total sample size would be

z=1.96, p=50%=0.5, 1-p= (1- 0.5) and d=0.05

n= $\frac{(1.96)^2 \times 0.5(1-0.5)}{(0.05)^2}$= $(1.96)^2$ (0.5) (0.5)/0.0025= 384.16≈384

By applying a finite population correction formula, the final sample size was calculated as; NF =n /(1+ (n /N) While, NF = the final sample size; n = the minimum sample size; N=Total number of pediatrics with age range of 2/12 -14years underwent ophthalmic surgery in HUCSH in the past retrospective three months which were 170 (from situational analysis). NF= n /1+ (n/N), NF = 384 / (1+ (384/170) = 117.8≈118 with a 10 % non-response rate 118×10%=11.8, NF=118+11.8=129.8 ≈ 130.

4.6.2 Sampling technique

A consecutive sampling technique was employed, where in every subject meeting the inclusion criteria was selected until the desired sample size was attained.

4.7 Methods of data collection, quality, and analysis

4.7.1 Data quality assurance and collection procedure

To ensure data quality, data collectors received training on the objectives and relevance of the study, as well as brief orientations on the assessment tools, before starting data collection. Information regarding the study's benefits, potential harms, and objectives was prepared in English, translated into Amharic, and explained to the study participants. Informed consent was obtained before data collected. The data collection process involved three trained data collectors and one supervisor. Pain was assessed by using the FLACC scale at 2, 4, 6, 8 and 24 hr, while preoperative anxiety was assessed using the modified Yale Preoperative Anxiety Scale-short form (m-YPAS-SF) in the holding area and during introduction to the anesthesia mask. Following the training provided to the data collectors, data was collected using a questionnaire adapted from the literature review. The questionnaire's internal consistency or reliability was assessed with a Cronbach's alpha value of 0.81 (81%) after a pretest of 10% of the patients who were excluded from the main study of the entire sample size was conducted.

4.7.2 Data processing and analysis

The data were analyzed using Statistical Package for Social Sciences (SPSS) version 26 software package. Both descriptive and inferential statistics were employed in the data analysis; the result was summarized by tables and figures. Logistic regression was used for the analysis technique to see the association of the independent variable and dependent variable. Variable with a p-value of 0.2 at bivariate analysis entered into multivariable analysis and p-value less than 0.05 in multivariable analysis was considered statistically significant. The model fitness was evaluated using the Hosmer-Lemeshow goodness of fit test. Before entering the multivariable model, the variance inflation factor (VIF) test and tolerance value(TV) were utilized to evaluate the explanatory variables for multicollinearity, ensuring that all variables had a VIF value of <10 and TV>0.1.

4.8 Ethical Considerations

Ethical clearance and approval were obtained from the Institutional Review Board (IRB) of Hawassa University College of Medicine and Health Science before the commencement of the study. Informed consent was obtained from parents by the data collectors after providing them with a detailed explanation of the study's objectives, potential benefits, and possible risks of participation.

4.9 Result dissemination plan

The study results will be submitted to the department of anesthesia. Additionally, the findings will be presented at various seminars, meetings, conferences, and workshops held at the College of Medical and Health Science. Furthermore, the results will be submitted for publication in both local and international journals.

4.10 Operational definition

Pediatrics population: The group of population aged 2 months -14 years old.

Postoperative pain: This is a form of acute pain following surgical intervention measured by behavioral pain scale (2).

FLACC scale: is a behavioral pain assessment tool used to measure pain following surgery in toddlers and newborns whose bodies and limbs are exposed; the observation should take five to ten minutes. Consist of five categories—face, legs, activity, cry, and consolability—each with a score between 0 and 2, resulting in a total score between 0 and 10. The overall score can be understood as follows: No pain is indicated by a score of 0, mild discomfort by 3, moderate pain by 4, and severe pain by 10 (5).

Anxiety: Is a feeling of fear or worry about a specific situation measured by MYPAS-SF.

MYPAS-SF: Modified Yale Preoperative Anxiety Scale score, short form, which has 4 domains and 18 items used to assess preoperative anxiety in children. If the score is between 22.92-30 indicates no anxiety and ≥ 30 indicates anxiety(39).

CHAPTER FIVE: RESULTS

5.1 Socio-demographic characteristics and perioperative condition of the participants

A total of 130 study participants were included in this study. In terms of socio-demographic factors, the majority of the participants were male 67(51.5%). Among the study participants, the largest age group comprised children between 6-14 years and accounts 53 (40.8%), while 9 (6.9%) of the patients were between 2 months and 1 year old (Table 1).

Table 1: Socio demographic characteristics of study participants underwent ophthalmic surgery at HUCSH from January 8-April 8, 2024 (n=130)

Variables	Category	Frequency (%) (N=130)	Postoperative pain	
			No	Yes
Sex	Male	67(51.5)	25	42
	Female	63(48.5)	15	48
Age in year	2/12-1	9(6.9)	2	7
	1-3	25(19.2)	5	20
	3-6	43(33.1)	10	33
	6-14	53(40.8)	23	30
ASA	ASA I	126(96.9)	38	88
	ASA II	4(3.1)	2	2

Majority of the participants were undergone elective surgery 93(71.5%), while the rest 37(28.5%) had emergency surgery. Seventy four (56.9%) of study participants were experienced preoperative anxiety. Among participants that were experienced preoperative anxiety, 63% have experienced POP. Most of the study participants did not have preoperative pain 110 (84.6%) and not take preoperative analgesia 113(86.9%) (Table2).

Table 2: Preoperative predictors of postoperative pain in participants underwent ophthalmic surgery at HUCSH from January 8-April 8, 2024 (n=130)

Variables	Category	Frequency (%) (N=130)	Postoperative pain	
			No	Yes
Urgency of surgery	Elective	93(71.5)	32	61
	Emergency	37(28.5)	8	29
Preoperative Anxiety	No	56(43.1)	29	27
	Yes	74(56.9)	11	63
Preoperative pain	No	110(84.6)	32	78
	Yes	20(15.4)	8	12
Preoperative analgesia given	Yes	17(13.1)	6	11
	No	113(86.9)	34	79

Among the study participants 85 (65.4%) received general anesthesia with a laryngeal mask airway (LMA), and the most common intraoperative analgesic agent administered was paracetamol suppository given to 63 (48.5%) patients. The majority of patients did not receive postoperative analgesia, accounting for 113 (86.9%) cases (Table 3).

In our study, we followed the study participants until they experienced postoperative pain, with a maximum follow-up time of 24 hours. Based on this study, the incidence of postoperative pain was higher during the middle of the postoperative period, with approximately 33% occurring at 4 hours, followed by 27% at 6 hours (Figure2) and (figure 3).

Table 3: Intraoperative and postoperative predictors of postoperative pain in participants underwent ophthalmic surgery at HUCSH from January 8-April 8, 2024 (n=130)

Variables	Category	Frequency (N=130)	Percentage (%)
Type of surgery	Strabismus surgery	16	12.3
	Cataract	15	11.5
	Corneal tear repair	40	30.8
	Other	59	45.4
Types of anesthesia	GA with ETT	18	13.8
	GA with LMA	85	65.4
	Sedation	27	20.8
Duration of surgery	<120 minutes	119	91.5
	≥120 minutes	11	8.5
Type of intraoperative analgesia given	Paracetamol	63	48.5
	Tramadol	10	7.7
	Fentanyl	15	11.5
	Ketamine	10	7.7
	Other	32	24.6
Type of postoperative analgesia given	Not used	113	86.9
	Tramadol	5	3.8
	Paracetamol	12	9.2

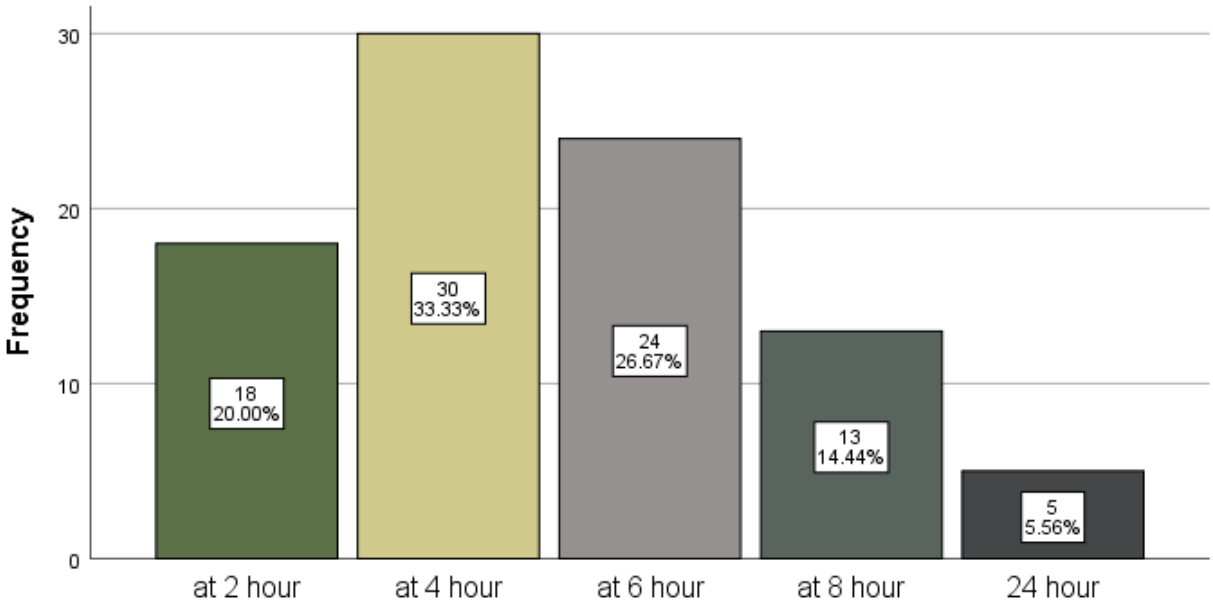

Figure 2: Bar chart showing incidence of postoperative pain in each follow up time

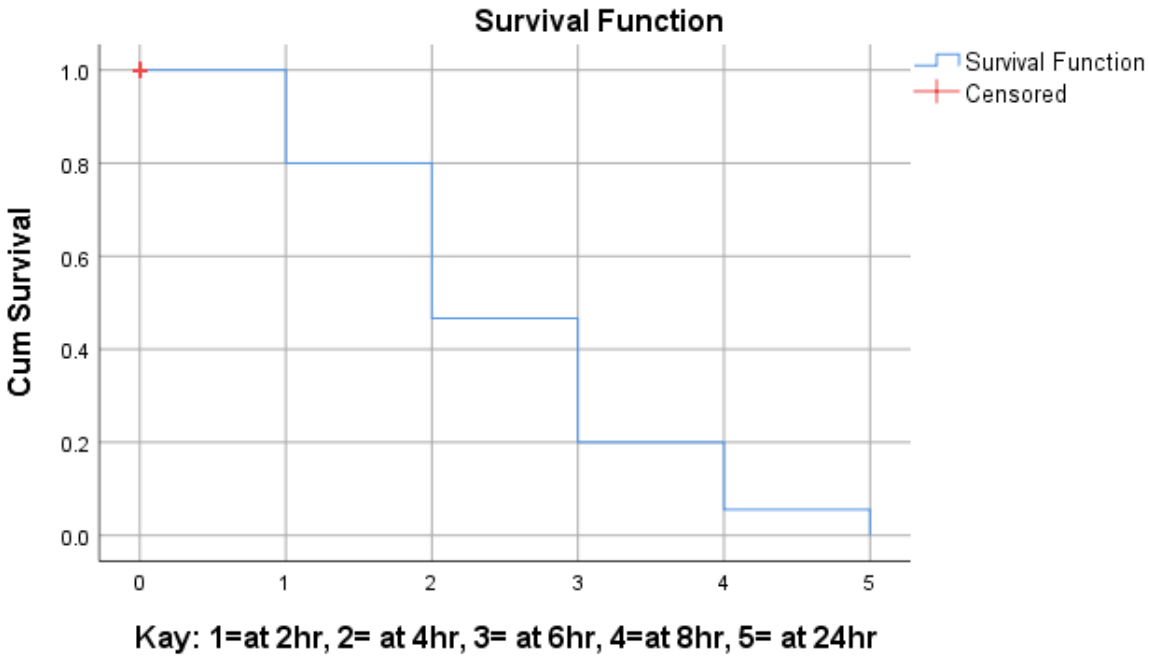

Figure 3: Kaplan Meier survival curve (time to event curve) for time to develop postoperative pain

5.2 Incidence of postoperative pain

The overall incidence of postoperative pain after ophthalmic surgery was 69.2 %(95%CI: 60.8-76.9) within 24 hours after surgery.

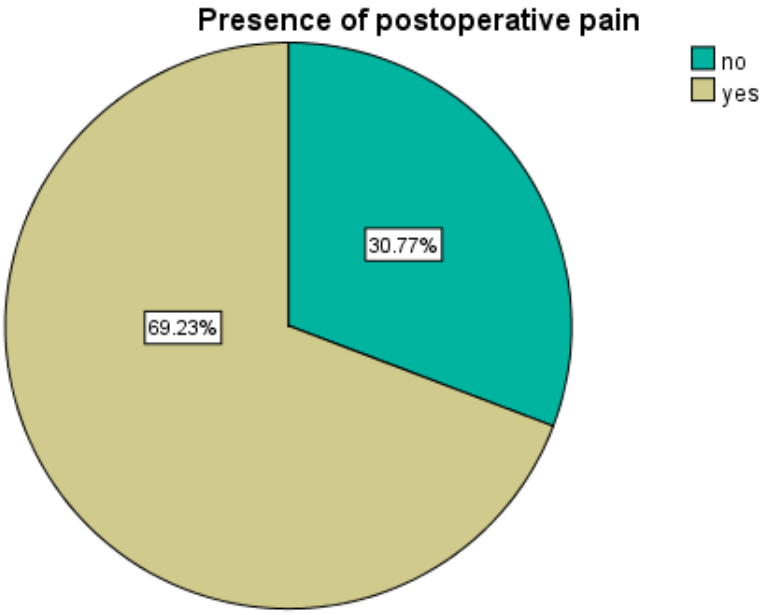

Figure 4: Pie chart showing incidence of postoperative pain following pediatric eye surgery

5.3 Predictors of postoperative pain

The bivariate analysis for this study revealed associations between age, sex, urgency of surgery, anxiety, type of surgery, and type of intraoperative analgesia with the incidence of postoperative pain in ophthalmic surgery. Multivariable logistic regression analysis in this study identified as independent predictors of postoperative pain, pediatric patients age 3-6 years were 3.67 times (AOR: 3.672, 95% CI: 1.119-12.049) more likely to had postoperative pain than age of 6-14 years. Similarly, pediatric patients who had anxiety at the preoperative period were 9.82 times more likely to had postoperative pain than who were not anxious (AOR: 9.820, 95% CI: 3.348-28.807). It also revealed that the likelihood of having post-operative pain was 4.44 times higher among patients emergency surgery than elective surgery (AOR: 4.441, 95% CI: 1.317-14.975). The study also revealed that patients who underwent procedures other than strabismus surgery were 9.7% of less likely to develop postoperative pain compared to those who underwent strabismus surgery [AOR=0.097, 95%CI: (0.010-0.961)] (Table 4).

Table 4: Bivariate and multivariable logistic regression analysis showing predictors associated with postoperative pain among pediatrics that underwent ophthalmologic surgery at HUCSH from January 8-April 8, 2024 (n=130).

Variables	Category	Outcome (postop pain)		COR(95% CI	P-Value	AOR(95% CI	P-Value
		No	Yes				
Sex	Male	25	42	1		1	
	Female	15	48	1.905(0.889-4.083)	0.098	1.964(0.710-5.437)	0.194
Age in year	2/12-1	2	7	2.683(0.509-14.151)	0.245	3.678(0.397-34.091)	0.252
	1-3	5	20	3.067(1.000-9.403)	0.050	3.786(0.924-15.506)	0.064
	3-6	10	33	2.530(1.037-6.173)	0.041	3.672(1.119-12.049)	0.032*
	>6	23	30	1		1	
Urgency of surgery	Elective	32	61	1		1	
	Emergency	8	29	1.902(0.779-4.640)	0.158	4.441(1.317-14.975)	0.016*
Anxiety	No	29	27	1		1	
	Yes	11	63	6.152(2.689-14.074)	0.000	9.820(3.348-28.807)	0.000*
Types of procedure	Strabismus surgery	1	15	1		1	
	Cataract	4	11	0.183(0.018-1.876)	0.153	0.542(0.039-7.443)	0.647

	surgery						
	Corneal tear repair	14	26	0.124(0.015-1.038)	0.054	0.097(0.009-1.018)	0.052
	Other(EUA, foreign body and Stitch removal)	21	38	0.121(0.015-.978)	0.048	0.097(0.010-0.961)	0.046*
Types of intraoperative analgesia	Paracetamol	15	48	2.189(0.879-5.456)	0.093	2.630(0.776-8.922)	0.121
	Tramadol	2	8	2.737(0.499-15.019)	0.246	7.267(0.746-70.798)	0.088
	Fentanyl	7	8	0.782(0.227-2.690)	0.696	0.824(0.164-4.128)	0.814
	Ketamine	3	7	1.596(0.347-7.339)	0.548	1.263(0.189-8.415)	0.809
	Other(multi modal)	13	19	1		1	

Key:*: Significant, 1: Reference, AOR adjusted odds ratio, COR crude odds ratio, CI confidence interval, EUA: Examination under anesthesia

CHAPTER SIX: DISCUSSION

Postoperative pain is a type of acute pain following surgical intervention (2). Because ophthalmic surgery involves less extensive trauma than other types of surgery, it is commonly believed to cause little to no postoperative pain. As a result, postoperative pain following ophthalmic surgery has received little attention, and there is little information available regarding the development of postoperative pain and factors that predict postoperative pain after ophthalmic surgery (40, 41). This study aims to assess the incidence of POP and to identify key predictors independently associated with development of such pain following pediatric ophthalmic surgery.

6.1 Incidence of postoperative pain

This prospective cohort study found that the incidence of postoperative pain among pediatric patients who underwent ophthalmologic surgery was 69.2% (95% CI: 60.8, 76.9). This finding is in line with a study conducted by HJ Paik et al in Korea (66.6%). They demonstrated child pain has been poorly managed and calls the need of a systematic, integrated pain management protocol with non-pharmacological and pharmacological management to reduce postoperative pain in pediatrics following eye surgery(19).

Our study finding is higher than a study done by Ducloyer et al in France. The study reported a postoperative incidence of 27% in patients undergoing strabismus surgery and 9% in those undergoing other procedures (42).This discrepancy could be due to differences in study population, unable to use the existing pain management, lack of strong opioids.

According to a study conducted in Canada, the incidence of postoperative pain was initially found to be 47.3% and 21% after the implementation of an evidence-based perioperative care bundle, which is lower than our study findings(24). The difference may be due to variations in inclusion criteria, application of ERAS protocol and individual care bundle implementation.

Another study done in India found that 12%, 24%, 40%, and 28% of patients experiencing postoperative pain at 30 minutes, 2 hours, 6 hours, and 24 hours after surgery, respectively (43). This result is lower than our study findings. The discrepancy may be due to usage of more effective pain management techniques such as peribulbar blocks.

In this study, the incidence of post-operative pain was higher than in a study conducted in Addis Ababa, where the incidence of postoperative pain was 36.6% at 12 h, 20% at 24 h, and 10% at 36 h and also a study done in Gondar (40.5%) (32, 44). The discrepancy might be due to differences in surgical types, availability of strong opioids and they might have used nerve block.

6.2 Predictors of postoperative pain

Our findings showed age as a predictor of POP. Participants aged between 3-6 years were 3.7 times more likely to develop postoperative pain compared to those 6-14 years [AOR=3.672, 95%CI: (1.119-12.049)]. This study finding is in line with the study conducted by World Federation of Societies of Anesthesiologists (45).

Our study result revealed that; the occurrence of postoperative pain did not have a statistically significant correlation with sex of children. Studies done in Brazil and Canada also found no significant association was observed among these variables, they suggest that while girls are not more about their POP experience than boys, they do report more unpleasantness from their pain experience or display less pain tolerance than boys (46, 47).

Related to preoperative factors, our findings indicated that preoperative anxiety was a significant predictor of POP. Patients who experienced anxiety were 9.8 times more likely to have POP compared to those without anxiety [AOR=9.820, 95%CI: (3.348-28.807)]. In line with this finding, several earlier studies reported preoperative anxiety as a significant factor contributing to POP (Addis Ababa (32), Gondar (37), Singapore(48), Colombia(49).

Urgency of the surgery was other preoperative predictors of POP in the present study. This study revealed that participants who underwent emergency ophthalmic surgery were 4.4 times more likely to develop postoperative pain compared to those who underwent elective surgery [AOR=4.441, 95%CI: (1.317-14.975)]. This finding is consistent with the study conducted in South Africa(30).

From the intraoperative-related factors examined, the type of surgical procedure was found to be significantly associated with postoperative pain. Specifically, this study revealed that patients who underwent procedures other than strabismus surgery were 9.7% less likely to develop postoperative pain compared to those who underwent strabismus surgery [AOR=0.097, 95%CI:

(0.010-0.961)]. This finding is consistent with the results reported in a previous study conducted in France (42), Germany(10) and Canada(24).

6.3 Strength of the Study

- Since there is no sufficient data on this research title, the findings will serve as an important source of information for local and global stakeholders as well as for researchers.
- This study is a prospective follow up study which is important to minimize recall bias.

6.4 Limitations of the Study

- The study was conducted in single center which may be difficult to make generalization.
- We utilized a consecutive non probability sampling technique, which can increase the potential for selection bias.

CHAPTER SEVEN: CONCLUSION AND RECOMMENDATION

7.1 Conclusion

The incidence of postoperative pain within 24 hours after pediatric ophthalmic surgical procedures was high. The key predictors found to be significantly associated with postoperative pain in this study were patient age, urgency of the surgery, preoperative anxiety levels, and the type of surgical procedure performed.

7.2 Recommendation

Based on the key findings of this study, we recommend the following:

1. **For clinicians**

Our findings indicate that preoperative anxiety is significantly associated with increased postoperative pain. As a result, it is crucial to implement strategies to effectively evaluate and manage preoperative anxiety using a combination of pharmacological and non-pharmacological therapies.

2. **For the institution**

Our study identified several unpreventable predictors that were associated with increased incidence of postoperative pain, including age, urgency of surgery, and type of surgical procedure. Given the significant impact of these factors, healthcare institutions should heighten awareness of this issue and aim to enhance clinicians' knowledge and preparedness in managing postoperative pain. This may involve providing targeted and regular training, as well as ensuring adequate resources are available to deliver comprehensive, multimodal pain management strategies.

3. **For researchers**

Due to limited available information on the incidence of postoperative pain in pediatric ophthalmic surgery, there should be clear and further similar studies in this area. Researchers should be encouraged to investigate this issue more broadly in the general pediatric population, to identify the overall burden of postoperative pain in ophthalmologic surgery. Such studies aimed to address the limitations and gaps observed in the current research, providing a more comprehensive understanding of the factors contributing to postoperative pain in this patient population.

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ANNEX

Annex 1: Information sheet and consent

Hello greeting, my name is……., a 2nd-year postgraduate student studying Msc in advanced clinical anesthesia at Hawassa University College of Medicine and health science. I am going to research the **"Incidence and predictors of postoperative pain in pediatric patients undergoing ophthalmological surgery at Hawassa University Comprehensive Specialized Hospital"** for the fulfillment of a Master of Science (Msc) in Advanced Clinical Anesthesia at Hawassa University College of Medicine and Health Science. So I would like to ask you some questions relevant to the study at different times. This questionnaire aims to gather information about the study aimed to assess the incidence and predictors of postoperative pain in pediatric patients undergoing ophthalmological surgery at Hawassa University Comprehensive Specialized Hospital**.** You will neither benefit nor harm by involving in this participation and your confidentiality will be held and your information will be important for the study. If you have any questions about the study any time you can contact me by using my mobile phone number: +2519-32797361 or E-mail: alemlanchmebrat@gmail.com. Do you have your permission to continue?

1. If yes, signature of participant _____and continue to the next page

2. If no skip to the next participant

Informed consent certified by the interviewer

Date of interview_____

Name of interviewer_____signature_____

Name of supervisor_____signature_____

Principal Investigator_____signature_____

Date of check in_____

ኣባሪ 1፡ የመረጃ ወረቀት እና ስምምነት

ጤና ይስጥልኝ ሰላም: እኔ..... በሀዋሳ ዩኒቨርሲቲ ህክምናና ጤና ኮሌጅ በከፍተኛ ክሊኒካል ሰመመን የሁለተኛ ዲግሪ ሳይንስ (ማስተር ኦፍ ሳይንስ) ለማሟላት ከቀዶ ህክምና በኋላ የዓይን ህክምና በሚደረግላቸው ህጻናት ላይ የሚደርሰውን ህመም እና መንስኤዎች ላይ ጥናት ላካሂድ ነው። ስለዚህ በተለያዩ ጊዜያት ከጥናቱ ጋር የተያያዙ አንዳንድ ጥያቄዎችን ልጠይቅህ እፈልጋለሁ። የዚህ መጠይቅ አላማ በሃዋሳ ዩንቨርስቲ ኮምፕረሄንሲቭ ስፔሻላይዝድ ሆስፒታል የዓይን ህክምና በሚደረግላቸው ህጻናት ላይ ከቀዶ ህክምና በኋላ የሚሰማቸውን ህመም እና ተያያዥ ምክንያቶች ለመገምገም የታለመውን ጥናት መረጃ መሰብሰብ ነው። በዚህ ተሳትፎ ውስጥ በመሳተፍ ምንም አይጠቅሙም እና አይጎዱም እና ምስጢራዊነትዎ ይጠበቃል እና መረጃዎ ለጥናቱ አስፈላጊ ይሆናል. ስለ ጥናቱ በማንኛውም ጊዜ ጥያቄ ካሎት የሞባይል ስልኬን +2519-32797361 ወይም ኢሜል: alemlanchmebrat@gmail.com በመጠቀም ሊያነጋግሩኝ ይችላሉ. ለመቀጠል ፍቃድ አለህ?

1.አዎ ከሆነ፣የተሳታፊ ፊርማ_____እና ወደሚቀጥለው ገጽ ይቀጥሉ

2. ከሌለ ወደ ቀጣዩ ተሳታፊ ይሂዱ

በቃለ መጠይቅ አድራጊ የተረጋገጠ በመረጃ የተደገፈ ስምምነት

የቃለ መጠይቁ ቀን _____

የቃለ-መጠይቅ ጠያቂው ስም_____ፊርማ _____

የሱፐርቫይዘሩስም _____ ፊርማ _____

ዋና መርማሪ_____ ፊርማ_____

የተረጋገጠበት ቀን _____

Annex 2: Questionnaire

Instruction: For each question, please circle the number of alternative (s) that fit the response, and fill the black space provided or choice from the given alternatives.

Data code _____

Card number_____

Table 1: Socio demography

Serial no.	Question	Response	Code
001	Sex	1. Male 2. Female	
002	Age (In the year)	1.2/12 -1year 2.1-3 years 3.3-6 years 4.6-14 years	

Table 2: Preoperative related risk factor

Serial no.	Question	Response	Code
003	ASA status	1. ASAI 2. ASA II	
004	Urgency of surgery	1. Elective 2.Emergency	
005	Preoperative anxiety	1. No (If mYPAS-SF scores between 22.92-30) 2. Yes (If mYPAS-SF scores ≥ 30)	
006	Preoperative pain(presence)	1. No 2. Yes	
007	Preoperativeanalgesiagiven	1.Yes 2.No	

Table 3: Intraoperative risk factors

Serial no.	Question	Response	Code
008	Type of surgery	1) Strabismus 2) Cataract 3) Corneal tear repair 4) Other_____	
009	Types of anesthesia	1) GA with ETT 2) GA with LMA 3) Sedation 4) Other_____	
010	Duration of surgery	1. <120 minutes 2. ≥120 minutes	
011	Type of analgesia given	1. Paracetamol 2. Tramadol 3.Fentanyl 4. ketamine 5. Other_____	

Table 4: Postoperative risk factor

Serial	Question	Response	Code
012	Type of analgesia given	1. Not used 2. Tramadol 3. Paracetamol 4. Other_____	

Table 5: Pain score and outcome

013	Pain score					
		At 2hr	At 4hr	At 6hr	At 8hr	At 24hr
	Total pain score for children with FLACC scale					
014	Outcome					
	Postoperative pain	0. No 1. Yes				

Annex 3: Supplemental material

1. FLACC scale used to assess pain

Exposed the patient's body and limbs, then observe for 2-5 minutes and assess the pain status by using FLACC scale found in table 6 below. Each behavior is scored 0 to 2, with total scores subsequently ranging from 0 to 10.

Criteria	Response	Scoring
Faces	No particular expression or smile	0
	Occasional grimace or frown; withdrawn, disinterested	1
	Frequent to constant frown, clenched jaw, quivering chin	2
Legs	Normal position or relaxed	0
	Uneasy, restless, tense	1
	Kicking or legs drawn up	2
Activity	Lying quietly in, a normal position, moves easily	0
	Squirming, shifting back and forth, tense	1
	Arched, rigid, or jerking	2
Cry	No cry (awake or asleep)	0
	Moans or whimpers, the occasional complaint	1
	Crying steadily, screams or sobs; frequent complaints	2
Consol ability	Content, relaxed	0
	Reassured by occasional touching, hugging, or being talked to; distractible	1
	Difficult to console or comfort	2

Table 6: The FLACC behavioral pain assessment scale

2. Tools to assess anxiety scoring: by using mYPAS-SF (modified Yale Preoperative Anxiety Scale score, short form), which has 4 domains and 18 items. Give 1 for each time point. Each score is calculated by dividing each item rating by the highest possible rating (i.e., 6 for the 'vocalizations' item and 4 for all other items), adding all of the produced values, dividing by 4, and multiplying by 100. This calculation produces a score ranging from 22.92 to 100 with higher values indicating higher anxiety

A. Activity (at waiting area_____ at operation room_____)

1 = Looking around, curious, playing with toys, reading (or other age-appropriate behavior); moves around holding area/treatment room to get toys or go to parent; may move toward OR equipment

2 = Not exploring or playing, may look down, may fidget with hands or suck thumb (blanket); may sit close to parent while waiting, or play has a definite manic quality

3 = Moving from toy to parent in an unfocused manner, non-activity derived movements; frenetic/frenzied movement or play; squirming, moving on table, may push mask away or clinging to the parent

4 = Actively trying to get away, pushes with feet and arms, may move the whole body; in the waiting room, running around unfocused, not looking at toys or will not separate from parent, desperate clinging

B. Vocalizations (at waiting area_____ at operation room_____)

1 = Reading (non-vocalizing appropriate to activity), asking questions, making comments, babbling, laughing, readily answering questions but may be generally quiet

2 = Responding to adults but whispering, "baby talk", only head nodding

3 = Quiet, no sounds or responses to adults

4 = Whimpering, moaning, groaning, silently crying

5 = Crying or maybe screaming "no"

6= Crying, screaming, sustained (audible through the mask)

C. Emotional Expressivity (at waiting area_____at operation room_____)

1 = manifestly happy, smiling, or concentrating on play

2 = Neutral, no visible expression on the face

3 = Worried (sad) to frightened, sad, worried, or tearful eyes

4 = Distressed, crying, extremely upset, may have wide eyes

D. State of Apparent Arousal (at waiting area_____at operation room_____)

1 = Alert, looks around occasionally, notices watches what anesthesiologist does with him/her (could be relaxed)

2 = Withdrawn child sitting still and quiet, maybe sucking on thumb or face turned into adult

3 = Vigilant looking quickly all around, may startle to sounds, eyes wide, body tense

4 = Panicked whimpering, may be crying or pushing others away, turns away

By adding all of the above

If the score is between 22.92-30 no anxiety

If the score is ≥ 30 the patients have anxiety

Assessment will be:

1. At the beginning of the preoperative process in the holding area and
2. In the OR when the anesthesia mask is introduced to the child