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PREOPERATIVE ANXIETY IN PEDIATRIC BURN SURGERY: EVALUATION USING THE MODIFIED YALE PREOPERATIVE ANXIETY SCALE

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ABTRACTS

Objective and methodology: *This study aimed to assess the preoperative anxiety status of pediatric burn patients prior to surgery through a prospective observational design with repeated measures conducted at Le Huu Trac National Burn Hospital (Hanoi, Vietnam) between January and October 2025. 135 children aged 2 - 10 years (ASA I - II) with TBSA (1 - 15%) undergoing elective debridement or skin grafting under laryngeal mask airway anesthesia were enrolled. Anxiety was measured with the modified Yale Preoperative Anxiety Scale (mYPAS) at three time points (T1: ward; T2: parental separation; T3: before induction).*

Results: *Mean mYPAS scores significantly increased across time points: 38.37 ± 6.66 at T1, 49.36 ± 8.11 at T2, and 51.23 ± 8.52 at T3. Preschool children (< 72 months) exhibited higher anxiety than school-aged children (≥ 72 months) at all time points ($p < 0.05$). Children with previous surgical exposure also demonstrated higher anxiety levels compared with those undergoing their first procedure ($p < 0.05$).*

Conclusion: *Preoperative anxiety was highly prevalent among pediatric burn patients, especially in younger children and those with prior surgical experience. Anxiety levels increased significantly during parental separation and anesthesia induction. These findings emphasize the need for routine assessment using validated behavioral tools such as mYPAS and for implementing age-appropriate anxiety-reduction strategies in perioperative care*

Keywords: *Pediatric burns, preoperative anxiety, mYPAS.*

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1. INTRODUCTION

Preoperative anxiety (POA) refers to the emotional distress experienced by patients before surgery [1]. In children, it manifests as fear, crying, withdrawal, or agitation and can significantly impact anesthetic induction and postoperative recovery. The prevalence of POA in pediatric surgical populations ranges from 40-60% [2], but rates are even higher among children with chronic or repeated surgical exposure such as burn patients.

Burn injuries constitute a traumatic experience characterized by severe pain, repeated interventions, and visible scars. Pediatric burn patients frequently undergo multiple surgeries for debridement and skin grafting, often within short intervals. This repeated exposure to medical environments may heighten anxiety rather than promote habituation. Assessment of anxiety in burned children is particularly challenging because pain, limited communication, and prior traumatic experiences can mask or exaggerate emotional responses.

While several tools exist for assessing anxiety in children, most rely on self-report and are unsuitable for younger patients or those experiencing pain and communication difficulties. The Modified Yale Preoperative Anxiety Scale (mYPAS) was selected because it is a validated behavioral instrument, widely used in pediatric anesthesia, and sensitive to observable anxiety cues even in nonverbal or distressed children. These features make mYPAS particularly appropriate for pediatric burn patients, whose emotional expression is often influenced by pain and prior traumatic procedures [3].

Despite the clinical importance, few studies have quantitatively evaluated preoperative anxiety specifically in pediatric burn populations. Understanding the anxiety pattern and its determinants in this vulnerable group is crucial for optimizing perioperative care. This study aimed to evaluate preoperative anxiety levels and temporal changes across three perioperative stages using the mYPAS, and to compare anxiety by age group and previous surgical experience.

2. METHODOLOGY

2.1. Subjects

A prospective observational study with repeated measures was conducted at Le Huu Trac National Burn Hospital, Hanoi, Vietnam. Data collection occurred between January and October 2025. The study was approved by the head of Department of Pediatrics Burn Care and Department of Anesthesia. Written informed consent was obtained from all caregivers; assent was obtained when appropriate according to age and local regulations. Participation or non-participation did not affect clinical care.

Participants: Pediatric burn patients aged 2 - 10 years (ASA physical status I - II) with burns involving 1 - 15% of total body surface area (TBSA) scheduled for their debridement or grafting under laryngeal mask airway (LMA) anesthesia.

Exclusion criteria: Patients with developmental delay or psychiatric disorders interfering with behavioral observation, emergency procedures or administration of anxiolytic medication prior to assessment.

2.2. Study procedure

Eligible patients were selected for the study according to the medical examination and surgical procedures currently being applied at the Le Huu Trac National Burn Hospital.

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The condition and anxiety level of the children before surgery were assessed using The Modified Yale Preoperative Anxiety Scale (mYPAS) (Table 1) at following time points:

+ T1: On surgical ward (baseline) (mYPAS1)

+ T2: Upon parental separation at OR door (mYPAS2)

+ T3: Inside the OR before induction (mYPAS3)

The mYPAS is an observational behavioral checklist with 22 elements divided into five categories: activity, emotional expression, state of arousal, vocalization, and usage of parents. The adjusted score, derived using the following formula: (activity/4 + emotional expression/4 + state of arousal/4 + parental use/4 + vocalization/6) × 100/5 range from 22.92 (no anxiety) to 100 (maximum anxiety). Assessments were performed by nurse observers blinded to patient history. They had also been received standardized training before.

A weight-based dose of ketamine was administered intramuscularly after completion of the anxiety assessment, followed by establishment of an intravenous line. The patient was then anesthetized according to the standard laryngeal mask airway (LMA) protocol used for skin grafting procedures at Le Huu Trac National Burn Hospital.

2.3. Data collection and analysis

The parameters were recoded including: patient demographics (age, gender, height, weight, BMI, total body surface area (TBSA)); mYPAS at three timepoints: T1, T2, T3.

The Statistical Package for Social Science 22.0 (SPSS 22.0) software was used for data analysis. Data was expressed as either mean or standard deviation ($\bar{X}$ ± SD) or numbers and percentages. mYPAS score was analyzed using a mixed-design (split-plot) repeated-measures ANOVA, with Time (three levels: T1 - ward, T2 - parental separation, T3 - induction) as the within-subject factor, and Age Group (preschool [24-72 months or 6 years] vs. school-age [≥72 months or 6 yeaurs]) or Surgical Experience (first vs. repeated surgery) as between-subject factors.

Table 1. The Modified Yale Preoperative Anxiety Scale [4]

Domain	Score
Activity	
Looking around, curious, playing with toys, reading (or other age-appropriate behavior); moves around the holding area/treatment room to get toys or go to parent; may move toward OR equipment.	1
Not exploring or playing; may look down, fidget with hands, or suck thumb/blanket; may sit close to parents while waiting or play has a definite manic quality.	2
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.	3
Actively trying to get away, pushes with feet and arms, may move whole body; in waiting room, running or unfocused, not looking at toys, or will not separate from parent.	4

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Domain	Score
Vocalizations	
Reading (non-vocalizing appropriate to activity), asking questions, making comments, babbling, laughing, readily answering questions but may be generally quiet; child too young to talk in social situations or too engrossed in play to respond.	1
Responding to adults but whispers or uses ‘baby talk’; only head nodding.	2
Quiet, no sound or responses to adults.	3
Whimpering, moaning, groaning, silently crying.	4
Crying or may be screaming ‘no’.	5
Crying, screaming loudly, sustained (audible through mask).	6
Emotional Expressivity	
Manifestly happy, smiling, or concentrating on play.	1
Neutral, no visible expression on face.	2
Worried (sad) to frightened, sad, worried, or tearful eyes.	3
Distressed, crying, extremely upset, may have wide eyes.	4
State of Apparent Arousal	
Alert, looks around occasionally, notices or watches anesthesiologist (could be relaxed).	1
Withdrawn child sitting still and quiet, may be sucking thumb and face turned in to adults.	2
Vigilant, looking quickly all around, may startle to sounds, eyes wide, body tense.	3
Panicked, whimpering, may be crying or pushing others away, turns away.	4
Use of parents	
Busy playing, sitting idle, or engaged in age-appropriate behavior and doesn't need parent; may interact with parent if parent initiates the inter action	1
Reaches out to parent (approaches parent and speaks to other wise silent parent), seeks and accepts comfort, may lean against parent	2
Looks to parent quietly, apparently watches actions, doesn't seek contact or comfort, accepts it if offered or clings to parent	3
Keeps parent at distance or may actively withdraw from parent, may push parent away or desperately clinging to parent and not let parent go	4

Table 2. Categorization of Preoperative Anxiety According to mYPAS Scores

Category	mYPAS Score	Interpretation
Minimal/Calm	≤ 30	No or minimal anxiety - the child remains cooperative, calm, and shows no clinical signs of distress.
Mild-Moderate	31 - 50	Observable behavioral anxiety such as mild crying, restlessness, or slight avoidance.
Severe	> 50	Marked anxiety characterized by intense crying, shouting, resistance to procedures, or pronounced agitation.

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3. RESULTS

Table 3. Participants' characteristics (n = 135)

Variable	Mean ± SD	Min	Max
Age (months)	59.55 ± 31.42	24	120
Weight (kg)	16.55 ± 6.55	8	35
Height (cm)	101.95 ± 22.22	52	153
TBSA (%)	7.37 ± 5.93	1	15
Male (%)/female (%)	89 (65.93%)/46 (34.07%)		

Comment: The study included 135 pediatric burn patients with a mean age of approximately 5 years (59.55 ± 31.42 months). Males comprised 65.93% (n=89) of the cohort.

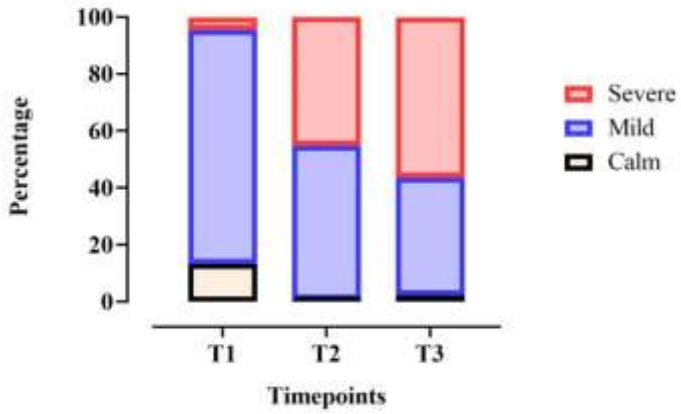

Figure 1. Preoperative anxiety level at different timepoints before surgery

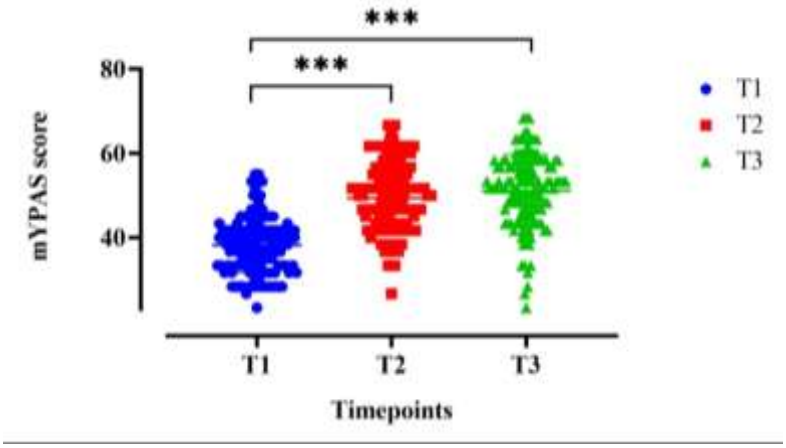

Figure 2. mYPAS score at different timepoints before surgery

(Note: (***): p<0.001 with T- test)

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Comment: The proportion of children with severe anxiety increased sharply from 4.4% at baseline to 45.2% at separation and 56.3% at induction, while the calm group nearly disappeared. This distribution underscores that preoperative anxiety escalates markedly as children transition from the ward to the operating room.

Table 4. Mean mYPAS scores by time and age group

Time point	Total (n=135)	Preschool-aged (24-72 months, n=89)	School-aged (≥ 72 months, n = 46)	p
mYPAS1 (Ward)	38.37 ± 6.66	39.89 ± 6.39	34.99 ± 5.63	< 0.001
mYPAS2 (Separation)	49.36 ± 8.11	50.88 ± 7.84	46.37 ± 7.88	< 0.01
mYPAS3 (Before Induction)	51.23 ± 8.52	52.12 ± 8.29	49.35 ± 8.87	< 0.05

Comment: Mean mYPAS scores increased significantly from the ward (T1) to separation (T2) and induction (T3) ($p < 0.001$), indicating a progressive rise in preoperative anxiety as the child approached anesthesia. Preschool-aged children (24 - 72 months) consistently showed higher anxiety scores than school-aged children at all time points, with the largest difference observed during parental separation.

Table 6. Mean mYPAS scores by time and the number of surgical intervention

Time point	Total (n=135)	The first surgery (n=115)	Repeated surgery (n=20)	p
mYPAS1 (Ward)	38.37 ± 6.66	37.68 ± 6.34	41.33 ± 7.00	< 0.05
mYPAS2 (Separation)	49.36 ± 8.11	48.72 ± 8.13	52.92 ± 8.13	< 0.05
mYPAS3 (Before Induction)	51.23 ± 8.52	50.35 ± 7.93	55.92 ± 10.55	< 0.01

Comment: Children undergoing repeated surgical interventions demonstrated significantly higher anxiety at all time points compared to those undergoing their first operation ($p < 0.05$). The difference was most pronounced at induction (T3), suggesting that previous surgical exposure may sensitize rather than desensitize children to perioperative stress.

4. DISCUSSION

The induction of anesthesia in pediatric burn patients poses unique challenges that affect both clinical management and the objective assessment of preoperative anxiety. Young children often lack the cognitive maturity to verbalize fear or use self-report scales effectively. Their anxiety is primarily expressed through behavior, which may be confounded by pain, procedural discomfort, or lingering stress from previous medical interventions. Moreover, there is no universally accepted gold standard for measuring preoperative anxiety in children. In burn cases, this anxiety is often intensified by the visible nature of the injury, concerns about cosmetic and functional outcomes, and the repeated hospitalizations typical of burn treatment. Consequently, the induction phase becomes a particularly sensitive and

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high-risk period requiring both clinical vigilance and emotional support.

In our study, all pediatric burn patients exhibited varying degrees of anxiety before surgery. The proportion of children with severe anxiety increased sharply from 4.4% at baseline to 45.2% at separation and 56.3% at induction, while the calm group nearly disappeared. This distribution underscores that preoperative anxiety escalates markedly as children transition from the ward to the operating room (Figure 1 and figure 2). Age was inversely associated with anxiety scores; preschool-aged children (< 6 years or 72 months) displayed significantly higher anxiety than school-aged children (≥ 6 years). Conversely, children with a history of previous surgeries showed higher anxiety levels compared to those undergoing their first operation (Table 4 and table 5).

The percentage of pediatric patients with preoperative anxiety reported in the Mustafa et al. study is entirely consistent with the results of our investigation [5]. Parental anxiety plays a critical role in shaping a child's emotional response. Caregivers who are anxious may unintentionally heighten their child's distress through verbal or nonverbal signals. Parental education level and residential background (urban vs. rural) were not evaluated in this study but may represent relevant psychosocial determinants for future research.[6]

Pain appeared to be the dominant contributing factor to preoperative anxiety [7]. Burn-related pain begins at the time of injury and persists throughout the healing process. Repeated painful procedures-such as dressing changes, injections, and blood sampling-further reinforce fear and anxiety, conditioning children to anticipate pain whenever they encounter medical environments.

High levels of anxiety complicate anesthetic procedure and perioperative management, making it more difficult to perform procedures such as intravenous catheterization, mask application, and monitoring setup. Severe preoperative anxiety may also lead to postoperative maladaptive behaviors and, in extreme cases, long-term psychological sequelae [1]. It is therefore essential that medical staffs, including anesthesiologists and nurses, adopt empathetic and child-centered communication to reduce anxiety before anesthesia. Parents should also receive guidance on how to provide reassurance effectively, since parental anxiety often amplifies the child's distress. Several pharmacologic and non-pharmacologic interventions have been proposed to alleviate preoperative anxiety. Non-drug methods include play therapy, music therapy, and digital distraction using tablets or smartphone games[8]. Pharmacological options such as oral midazolam remain effective for certain age groups [9]. Recent studies have also suggested that shortening preoperative fasting through carbohydrate supplementation can lower mYPAS scores and improve perioperative comfort [10].

To enhance the standard of care for pediatric burn patients, further research should explore the effectiveness of these strategies and support their integration into routine perioperative practice at Le Huu Trac National Burn Hospital.

5. CONCLUSION

Preoperative anxiety was highly prevalent among pediatric burn patients, especially in younger children and those

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with prior surgical experience. Anxiety levels increased significantly during parental separation and anesthesia induction. These findings emphasize the need for routine assessment using validated behavioral tools such as mYPAS and for implementing age-appropriate anxiety-reduction strategies in perioperative care.

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