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Preoperative Fasting Duration and Associated Factors in Pediatric Patients Undergoing Elective Surgery: A Prospective Study

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ABSTRACT

Introduction

Preoperative fasting prevents gastric aspiration, yet pediatric patients often endure prolonged fasting despite "6-4-2" guidelines. This study aims to determine average fasting durations for solid and liquid food in Nepal and identify causes of prolonged fasting and non-adherence to fasting guideline.

Methods

A total of 139 children up to 12 years were enrolled in this prospective observational study. Data about the fasting duration and the various causes of prolonged fasting were collected in the pre-operative holding area using a preformed questionnaire. Using the SPSS version 26, the median duration of fasting for each category was calculated, along with their interquartile range (IQR), the percentage of non-adherence, and the causes of prolonged fasting, as well as the signs and symptoms observed in children.

Results

Among 139 patients, 133(95.7%) of patients were not compliant with the fasting guideline. The median (IQR) duration of fasting for solid food, breast milk, and clear liquid was 12(3) hours, 5(2.75) hours, and 6(8) hours respectively. The major causes of prolonged fasting were poor NPO adherence, receiving different instructions from different individuals, and not receiving instructions according to the OT list. Among 139 patients, 57(41%) were thirsty, 31(22%) were irritable or crying, 41(29%) had dry mouth/lips with 4(2.8%) patients having skin pinch test positive and 4(2.8%) patients were dehydrated meeting the diagnostic criteria for dehydration.

Conclusion

This study demonstrates that fasting durations significantly exceed international guidelines in Nepal, primarily due to inconsistent instructions and non-individualized scheduling.

Keywords

ASA; elective surgery; pediatric patients; pre-operative fasting

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INTRODUCTION

Preoperative fasting before anesthesia and surgery is a usual practice for the prevention of gastric regurgitation and pulmonary aspiration, started in 1946 and evolved gradually over years. [1,2,3.] The latest American Society of Anaesthesiologists (ASA) guideline quotes 6 hours of fasting for solid food, 4 hours of fasting for breast milk, and 2 hours of fasting for clear liquid.[4]

Prolonged fasting affects the pediatric population more so than the adults due to their higher metabolic rate and small glycogen stores, which predispose them to rapid onset hypoglycaemia and dehydration. Moreover, unlike adults, children's lack developmental coping mechanisms to tolerate thirst and hunger, leading to increased perioperative distress, irritability, and non-compliance with instructions. Yet, they are unnecessarily fasted for a longer duration. Various studies show mean fasting duration for clear liquid to be 6.3 to 12.6 hours, for breastmilk 6.27 to 9.82 hours, for formula milk 9.9 hours, and for solids 10.0 to 14.08 hours. [5-11.]

Our main aim was to determine the average duration of fasting in pediatric patients posted for elective surgery. We also aimed to identify the causes of prolonged fasting, the causes of non-adherence to fasting guideline, and the signs and symptoms associated with prolonged fasting.

METHODS

This was a single-centre cross-sectional study conducted at the preoperative holding area of Tribhuvan University Teaching Hospital, Kathmandu from June 2023 to September 2023(4 months). The study was approved by the Institutional Review Committee (IRC) of the Institute of Medicine (IRC Ref no: 52196-11) E2 and adhered to the principles of the Declaration of Helsinki. Written informed consent was taken from parents in the pre-operative room after explaining the nature and purpose of the study.

We included children ≤12 years of age posted for elective surgery. Parents who did not give consent, emergency surgeries, intubated patients, and patients who were kept Nil per oral (NPO) for various surgical reasons like subacute intestinal obstruction, gastric outlet obstruction, etc were excluded from this study.

A structured questionnaire with closed-ended questions and pre-defined answer choices was used. The questionnaire consisted of two parts: Part one for parents/guardians, addressing parents or guardians and part two for researcher. The questionnaire was pretested on 10% of the sample, necessary modifications were made after analysis of responses, and a final draft was made. In the preoperative room, informed consent was taken from parents. Data from the questionnaire was gathered by the principal investigator through in-person interviews with parents. The principal investigator assessed the child's hydration status by asking the parents about any symptoms and examining the patient for any signs of dehydration. The information from patients whose surgeries were cancelled was collected by the principal investigator visiting the respective ward.

Our sample size of 139 patients was based on a prior study done at Red cross War Memorial Hospital in Cape Town by Kouvarellis et.al. who reported a standard deviation of 4.8 for clear liquid fasting duration.

The sample size was calculated using the following formula:

$n = Z^2\sigma^2 / d^2$

Where,
n= minimum required sample size,
Z= 1.96 at 95% Confidence Interval (CI)
σ= standard deviation taken from published literature and
e= margin of error.

Non-probability convenience sampling technique was used. The collected data was entered in MS Excel. The data was analysed using SPSS software version 26. We calculated the median duration, interquartile range, and range of each solid food, breast milk, and clear liquid for non-normally distributed data. Categorical variables were presented as frequencies and percentages. Statistical analysis was done to find out the associations between the order of the child in the OT list, admitted ward, and specialty with prolonged fasting using a Fisher's Exact Test.

Table 1. Median, interquartile range and range of fasting duration of different foods.

Types of food	Median	Interquartile range	Range
Solid	12 hours	3	5-20 hours
Breast Milk	5 hours	2.75	4-9 hours
Clear Liquid	6 hours	8	2-20 hours

Table 2. Demographic data (n=139)

characteristics	n (%)
Gender	
Male	92 (66%)
Female	47 (34%)
Age group:	
<1m (Neonate)	2 (1.4%)
1m-12m (Infant)	11 (7.9%)
1-3years (Preschool)	33 (23%)
4-12years (School going)	93 (66%)
Admitted wards:	
Pediatric surgery	56 (40.2%)
ENT ward	28 (20.1%)
Male surgery	24 (17.3%)
MRI	18 (12.9%)
Neurosurgery	5 (3.5%)
Eye ward	4 (2.8%)
Pediatric ward	3 (2.1%)
Plastic surgery	1 (0.7%)

Table 3. Reasons for prolonged fasting, non-adherence to fasting instructions, and various signs and symptoms

Reasons for prolonged fasting	n (%)
Child refused timed feed/ clear liquid	85 (61%)
Contradicting fasting instructions	38 (27%)
Non- individualized fasting instruction.	35 (25%)
Fear of OT being cancelled	24 (17%)
Did not understand the given instructions	16 (11%)
Lack of fasting instruction.	2 (1%)
No liquid offered during waiting period.	2 (1%)
Others*	1 (0.7%)
Signs and symptoms:	
Thirsty	57 (41%)
Dry lips/Mouth	41 (29%)
Irritable or crying	31 (22%)
Skin pinch test positive	4 (2.8%)

RESULTS

Out of the total 139 patients, 133 (95.7%) of patients were not compliant with the fasting guideline and had prolonged fasting in either of the categories. The median (IQR) duration of fasting for solid food was 12(3) hours. The median (IQR) duration of fasting for breast milk was 5 (2.75) hours. The median (IQR) duration of fasting for clear liquid was 6 (8) hours (Table 1).

Among 139 patients, 92 (66%) were male and 47 (34%) were female. Most of the patients 93 (66%) were from school going age group 4-12 years while 33 (23%) of patients were preschool from the 1-3 years age group, 11(7.9%) were infants from 1m to 12m of age group and 2 (1.4%) of patients were neonates from less than 1m of age group. Most of the patients were from the pediatric surgery ward 56 (40.2%) followed by ENT ward 28 (20.1%) (Table 2)

The most common reasons for prolonged fasting include the child did not want to take food at the precise time to match the NPO instruction provided by the pre-anesthetic team 85 (61%), receiving different instructions from different individuals 38 (27%), not receiving instructions according to the OT list 35 (25%), and fear of cancellation of scheduled procedure 24 (17%) (Table 3).Among 139 patients, 57(41%) were thirsty, 31(22%) were irritable or crying, 41(29%) had dry mouth/lips with 4(2.8%) patients having skin pinch test positive and 4(2.8%) patients were dehydrated meeting the diagnostic criteria for dehydration (Table 3).

Statistical analysis was done to know the associations between the order of the child in the OT list, admitted ward, and specialty with prolonged fasting but the result was statistically not significant. As shown in Table 5, the P-value of the association between the order in the list and prolonged fasting was 0.164 and the P-value of the association between ward and prolonged fasting was 0.772.

DISCUSSION

The main aim of our study was to find the average duration of fasting for solid food, breast milk, and clear liquid in a pediatric population less than 12 years old. In our study, the median duration of fasting for solid food was 12 hours, breast milk was 5 hours, and clear liquid was 6 hours. These results showed that the duration of fasting in the pediatric population exceeded the existing guidelines for fasting given by the ASA. One of the patients even fasted for 20 hours for both solid and clear liquid. Furthermore, only 6 out of 139 patients (4.3%) adhered to fasting guidelines. Our findings on fasting duration in pediatric patients are consistent with similar studies done in other parts of the world. For instance, the results align with those from investigations by B G Arun et al. in India,[9] where the fasting duration in children for solid food was 11.25 hours and clear liquid was 9.25 hours. Alvi

Nl et al. in Pakistan[10] also performed a similar study in pediatric patients where the fasting duration for solid food was 12 hours and clear liquid was 9 hours. Likewise, studies by William et al. in the United States [5] showed a fasting duration of 10.62 hours for solid food and 10.44 hours for clear liquid in pediatric patients. Wilson et al. in the United Kingdom [8] also found comparable fasting durations for children undergoing surgery, with a solid food duration of 12.08 hours and a clear liquid duration of 7.95 hours. So, prolonged fasting is a problem in our neighbouring countries with similar socioeconomic backgrounds. Even in Western countries like the United States and the United Kingdom, prolonged fasting has been found in the pediatric population.

We also intended to find the common causes of prolonged fasting in pediatric patients in our hospital. Most of the children did not want to take clear liquid early in the morning, i.e., 85(61%). This means many children wouldn't wake up before 7 a.m., and those who do wake up refuse to drink clear liquid. Thirty eight (27%) parents were confused due to conflicting instructions given by different health workers which mean different instructions given by surgeons, anesthesiologists, and nurses. Twenty four (17%) patients did not follow the fasting instructions due to fear of surgery being cancelled. These findings were similar to a study done by Kouvarellis et al. in South Africa, where the main causes of prolonged fasting were poor adherence and inappropriate and inadequate fasting instructions.[11] It may not be practical to wake the child early in the morning for food. But in order to prevent the consequences of prolonged fasting, they can be offered clear liquid up to 2 hours before surgery. There are many studies about carbohydrate drinks given up to 2 hours before surgery, and a few studies have shown less metabolic stress, fewer symptoms, and improved gastric emptying with these kinds of drinks.[12,13.]

Although the adult population is less affected by prolonged fasting, it may have grave consequences for children. Many of our patients were thirsty (41%), irritable (22%), and had dry lips/mouths (29%), and four of them were dehydrated. A study done by Youwei et al., in China [14] in 2021 showed that the majority of children experienced hunger (17.5%), thirst (19.4%), and anxiety (16.1%). These findings further highlight the fact that children who fast for a prolonged period may have symptoms that make their perioperative period troublesome. Both physiological and metabolic consequences can arise that will affect the overall course of induction and intraoperative stability.[15,16,17] It has been shown in studies done previously by Huang et al., in 2022 [18] and Brady in 2009 [19] that prolonged preoperative fasting leads to postoperative complications like pain and vomiting. Prolonged preoperative fasting does not ensure empty gastric volume either. [12,13.]

We also tried to find the associations between the order of the child in the operation theatre list, admitted ward, and specialty with prolonged fasting, with the p-value of such correlations being 0.164, 0.772, and 0.708 respectively. All of these correlations were not statistically significant. Non-probability convenience sampling techniques resulting in uneven patient selection may be the cause of this lack of association.

This study was conducted at a single hospital among various wards. We do not know about the status of other hospitals in Nepal, as we couldn't find similar studies. So, we cannot generalize the findings. Relying on parents' reports for fasting duration and symptoms might introduce bias due to recall errors or misinterpretations. It was known among anesthesiologists that the pediatric population is being fasted for prolonged durations from our day-to-day experience. This study has helped us to know the duration of prolonged fasting, identify the common causes of prolonged fasting, and common signs and symptoms that patients suffer from due to prolonged fasting in a tertiary hospital in Nepal. So various measures, like following standard guidelines, good communication, and proper education among parents and healthcare workers, are needed to mitigate this problem. Further research needs to be done in the field of preoperative fasting in pediatric patients to further understand the situation and identify areas for improvement.

CONCLUSION

This study demonstrates that fasting durations significantly exceed international guidelines in Nepal, primarily due to inconsistent instructions and non-individualized scheduling. This prolonged fasting leads to high rates of perioperative thirst, irritability, and dehydration in children. Improving communication between surgical teams and parents, alongside strictly adhering to the 2-hour clear liquid rule, is essential to mitigate these avoidable clinical complications.

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CONFLICT OF INTEREST

The author(s) declare that they do not have any conflicts of interest with respect to the research, authorship, and/or publication of this article.

AUTHOR CONTRIBUTIONS

All authors have made substantial contributions to the conception and design of the study, data acquisition, analysis and interpretation. Sandeep Khatri led the study and manuscript drafting. Amit Sharma Bhattarai coordinated data collection, statistical analysis, and correspondence. Bigen Man Shakya and Pramesh Sunder Shrestha contributed to data analysis and critical revision of the manuscript. All authors approved the final version and agree to be accountable for all aspects of the work.

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