


**Research Article**

## Effect of Prolonged Preoperative Fasting on Intraoperative Glycaemia in Pediatric Surgery at the Essos-Cameroun Hospital Center (Cameroon)

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### Abstract

**Background:** Preoperative fasting is defined as any oral deprivation of food and fluids prior to surgery [1]. In children, prolonged preoperative fasting can lead to significant metabolic complications [2,3]. The general objective of our study was to determine the effects of prolonged preoperative fasting on intraoperative glycaemia in children under 5 years of age at the Essos-Yaoundé hospital center.

**Patients and methods:** This was a prospective, quantitative, descriptive study. It took place over a period of 7 months in the anesthesiology department of the Essos hospital center. All children under the age of 5, operated on during the survey period, were included.

**Results:** During the survey period, 40 patients met our inclusion criteria. The median age was 33 months, the sex ratio was 3.3 in favor of the male gender. The most common surgical procedure was tonsilectomy (52.2%). Solid food represented the last meal in 82.5% of cases. The mean duration of the preoperative fast was 698 minutes. Preoperative fasting was prolonged in 97.5% of participants. A proportion of 30% of the study population presented with hypoglycaemia at installation on the operating table. In the group of patients who observed a prolonged fast, hypoglycaemia was present in 96.4% of cases at installation on the operating table with a non-significant p value ( $p=0.51$ ).

**Conclusion:** Compliance with the recommendations of good clinical practice concerning preoperative fasting in children could contribute to improving anesthetic safety.

**Keywords:** Preoperative fasting; Blood sugar; Child under 5 years old.

### Introduction

Preoperative fasting is defined as any deprivation of food and oral fluids before surgery [1]. This is a safety measure whose objective is to prevent bronchial aspiration [1,2]. In addition to the negative impact on operative comfort and postoperative rehabilitation, extending the duration of the fast can lead to significant metabolic complications [2,3]. Prolonged fasting can be accompanied by a significant loss of glucose stores in children, leading to a risk of severe hypoglycemia [3,4,5]. Respecting preoperative fasting in children remains a challenge for the anesthetist in sub-Saharan Africa. Many authors describe the harmful effects of prolonged preoperative fasting in the pediatric population and propose solutions that tend to reduce it to the necessary minimum [3,6,7]. The main objective of our study was to determine the effects of prolonged fasting on intraoperative blood glucose levels in children under 5 years of age at the Essos hospital center in Cameroon.

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## Patients and Methods

This is a prospective, quantitative study with a descriptive aim which took place over a period of 7 months, from November 2019 to May 2020 in the anesthesiology department of the Essos-Yaounde hospital center (Cameroon). This is a high reference hospital, located in the capital of Cameroon. After approval by the ethics committee, the data was collected anonymously and used for exclusively scientific purposes. All children whose age was less than 5 years, operated in elective surgery during the above-mentioned period were included in the study. Data was collected from a series of questions and a non-participant observation grid. The series of questions made it possible to question the parents by asking questions relating to the preoperative instructions received at the anesthesia consultation, and the last meal of the child. Non-participant observation made it possible to collect intraoperative information from the children. The first blood sugar level was taken on admission to the operating room (before the insertion of the peripheral venous line), the second blood sugar level was taken at the end of the surgical procedure (before awakening from anesthesia). The general anesthesia induction procedure was standard for all participants. It was a face mask induction with sevoflurane. The intraoperative infusion solution for all patients was 1.2% glucose lactate ringer. It was obtained by making a mixture of Ringer's lactate 500 ml, with 20 ml of 30% glucose serum. The blood sugar level was measured at the medical analysis laboratory of the Essos hospital center, using programmable automatic machines, from a venous blood sample. Blood sugar was considered normal when it was between 0.8 and 1 g/l. Hypoglycaemia was defined by a blood glucose value  $\leq 0.7$ g/l and hyperglycaemia by a value  $\geq 1.10$ g/l. Preoperative fasting was said to be "prolonged" beyond the 6th hour if the last meal was solid, beyond the 4th hour if the last diet was semi-liquid and beyond the 2nd hour if the last food intake consisted of clear liquids [8]. The variables studied were the characteristics of the study population (age group, gender, reception service, type of surgery), and the anesthetic procedure (the instructions of the young preoperative, the nature of the last meal, the duration of the preoperative fast, the glycaemia at the installation on the operating table and at the end of the surgical procedure). The data collected was grouped anonymously, and confidentiality was respected. These data were entered, processed and analyzed by the statistical analysis software Epi-infos 7 and XL stat 2014. The Khi 2 test was used for the comparison of variables. The probability p less than 0.05 was considered significant.

## Results

During the survey period, 40 patients met our inclusion criteria for a total of 210 patients operated on at the Essos Cameroon hospital center during the same period, i.e. a participation rate of 19%. The characteristics of the study

population are shown in Table 1. The median age was 33 months with extremes ranging from 20 to 54 months. The sex ratio was 3.3 in favor of the male gender. The postoperative destination of the children was primarily the pediatric department (50%), the general surgery department in 45% of cases, the neonatology department in 15% of cases.

The group of children whose age was less than 36 months was the most represented in our sample. The otolaryngology specialty (57%) was the most represented and tonsillectomy was the most performed surgery (30%) in this group. Solid food was the last meal in 82.5% of cases, followed by semi-liquid food in 40% of cases, artificial milk and breast milk in 15% of cases each (Table 2). All the parents declared having

**Table 1:** Sociodemographic characteristics of the study population

Variables	Number (n)	Percentage (%)
<b>Gender</b>		
Male	28	70
Female	12	30
Total	40	100
<b>Age group (month)</b>		
]0-12]	10	25
]12-24]	11	27.5
]24-36]	7	17.5
>36	12	30
Total	40	100
<b>Postoperative reception service</b>		
Pediatric ward	20	50
Surgery department	18	45
Neonatology department	2	15
Total	40	100

**Table 2:** Distribution of patients according to the nature of the last meal

Variable	Number (n)	Percentage (%)
Cake	7	17.5
Potato fries	9	22.5
Fish	6	15
Beignets	4	10
Cookies	4	10
Chicken	3	7.5
Yogurt	12	30
Local rice porridge	3	7.5
industrial porridge (Cerelac*)	1	2.5
artificial milk	6	15
Breastmilk	6	15
Total	40	100

**Table 3:** Duration of preoperative fasting

Number (n)		Total duration (s)		Average duration		Variance		Standard deviation	
40		27951		698.7		29300.2		171.1	
Minimum	25%	Median		75%		Maximum		Mode	
320	580	175		792.5		1090		420	

**Table 4:** Correlation entre le jeûne prolongé et profil glycémique à l'installation sur table opératoire (p=0.51)

Prolonged fasting	Glycemic profile at installation in the operating room					
	Normal		Hypoglycemia		Total	
	n	%	n	%	n	%
Yes	27	96.4	12	100	39	97.5
No	1	3.6	-	-	1	2.5
Total	28	100	12	100	40	100

**Table 5:** Glycemic profile at installation in the operating room

Number (n)		Total duration (s)		Average duration		Variance		Standard deviation	
40		2632,0		65,8		215,0		14,6	
Minimum	25%	Médiane		75%		Maximum		Mode	
37,0	52,5	68,0		76,0		87,0		50	

received oral explanations relating to the instructions for preoperative fasting during the preanaesthetic consultation. These preoperative instructions were transcribed in the anesthesia file in 85% of cases. The average duration of the preoperative fast was 698 min (Table 3), i.e. 11 hours 38 minutes, with extremes ranging from 320 minutes (i.e. 5h 20 minutes) to 1090 minutes (i.e. say 6:10 p.m.). Preoperative fasting was prolonged in 97.5% of study participants. A proportion of 30% of the total workforce presented with hypoglycaemia on installation on the operating table (Table 4). In the group of children with hypoglycaemia, the lowest blood sugar was 0.37 g/l (Table 5). A tendency to hyperglycemia was encountered in 57.5% of cases, during glycemic control, at the end of the surgical procedure. There was no causal relationship between the nature of the last meal and the occurrence of hypoglycemia.

## Discussion

Preoperative fasting, which is a restriction of oral food and fluid intake a few hours before anesthesia [1], represents an important measure in anesthetic safety [3]. General anesthesia suppresses the pharyngolaryngeal reflexes which physiologically protect the airways, and exposes the patient to the risk of pulmonary aspiration syndrome, pneumonia or even death in the event of regurgitation or vomiting of gastric contents [9,10]. Currently, the trend is to impose a preoperative fast of 6 hours for solid foods, 4 hours for breast milk and 2 hours for clear liquids [1,6,11]. Most of the studies carried out on the subject of preoperative fasting in children tend to find a prolonged duration of fasting [3,7,11]. At the end of our study, 40 patients were registered, the study population was mainly male (70%). One could conclude that within the

population of children <5 years, the male gender is more exposed to surgical pathologies than the female gender. In the work carried out by Amengle et al [12], relating to the study of per and postoperative complications in pediatric anesthesia, the authors also found a strong male predominance (70.9%) in their study population (total population = 151 patients). These results could be explained by the predominance of certain surgical procedures that exclusively concern the male gender in this age group. Testicular lowering surgery, hydrocele cure and circumcision are perfect illustrations. At the end of the surgical procedure, the patients were referred first to the pediatric department. The most probable explanation is that, in a hospital which occasionally performs pediatric surgery, and which does not have a geographical space reserved for the postoperative care of children, the pediatric service may represent the best alternative for ensuring follow-up care. ENT surgery procedures were the most practiced in our cohort (57.5%), with a proportion of 30% for tonsillectomy. Illé S et al. carried out work on the results of 2 years of ENT surgery and cervico-facial surgery practices at the Niamey hospital [13], their study population was mainly pediatric (71%), tonsillectomy represented 42, 91% of activities. In sub-Saharan Africa, tonsillectomy represents more than half of the surgical activity of this specialty, in children <5 years [13-17]. In our work, the last meal was made of solid foods in 82.5% of cases, against 30% for artificial and breast milk. The children were not getting clear fluids in the hours before surgery. In addition, the average duration of preoperative fasting was significantly long (11 hours) in ¾ of study participants. Despite this prolonged fasting time, only a small proportion of the starting sample showed hypoglycemia (30%). This hypoglycaemia was corrected by

the intake of 10% glucose serum intravenously. Children should fast before surgery to promote gastric emptying. A prolonged period of fasting can lead to anxiety, fatigue, irritability, dehydration and biochemical disturbances, including hypoglycemia. The amount and quality of food or fluid that children need preoperatively varies with age. To optimize the safety of the surgical and anesthetic procedure, it is advisable to respect the prescriptions of the anesthesiologist concerning preoperative fasting. The end of the surgical procedure was marked by a tendency to hyperglycemia in all our patients. This non-significant tendency to postoperative hyperglycaemia could be explained by the nature of the intraoperative infusion solution, which partially contained glucose serum. Surgical stimuli generate the release of hyperglycemic catecholamines which may also contribute to this postoperative hyperglycemic tendency. Engelhardt T et al, conducted a study of 1350 children presenting for dental procedures [18]. The findings of this research work favored median fasting times of 12.08 h and 7.95 h for solid and liquid foods respectively, with the majority of children reporting feeling "extremely hungry" or thirsty on admission in the operating room [18]. The American study conducted by Williams C et al., involving 219 children revealed that the fasting time was significantly extended 10.44 h for liquids, 8.3 h for breast milk, and 10.62 h for solids [19]. The ¾ of our study population were children aged >1 year. This is an age that corresponds to the diversification of the child's diet, because their energy and nutrient needs are increased. The strong representation of this age group in our study population could be the reason that justifies the solid composition of the last meal (82%). The lengthening of the preoperative fasting time in our research work could be explained by the excessive caution of the parents in respecting the fasting times prescribed at the pre-anaesthetic consultation, the poor understanding of the fasting instructions by the latter or the lack of traceability of these instructions in the patient's medical file (15%). In children, prolonged fasting can lead to dehydration, hypoglycemia, hypovolemia, hypotension and other metabolic complications [2]. Based on current observations, children undergoing elective surgery should be able to take clear fluids up to 2 hours before surgery [1,3,6,20]. Studies have shown that taking clear fluids in children up to 2 hours before surgery reduces feelings of thirst and hunger, improves perioperative comfort compared to children who have been fasting for more than 6 hours [21]. The study's sample size can be considered an initial limitation since the number of patients was relatively small. Another limitation of our study was a single-center study, and the results should not be generalized. Additional research is required to evaluate the practice of pediatric anesthesia in an adult operating theater.

## Conclusion

Prolonged preoperative fasting is accompanied by a decrease in the body's glucose stocks, thus leading to the

activation of hepatic glycogenolysis and gluconeogenesis from the body's protein and lipid stocks. At the Essos hospital center, almost all of the operated children observe a prolonged fast potentially detrimental to the anesthetic procedure. Respecting the duration of preoperative fasting is an important step for improving practices and optimizing anesthetic safety at the Essos-Yaounde hospital center.

## Conflicts of interest

The authors declare no conflicts of interest.

## Author Contribution

All authors contributed to the development and conduction of this manuscript. All authors have read and approved the final version of the manuscript.

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## References

1. Practice guidelines for preoperative fasting and the use of pharmacologic agents to reduce the risk of pulmonary aspiration: application to healthy patients undergoing elective procedures: an updated report by the American Society of Anesthesiologists Task Force on Preoperative Fasting and the Use of Pharmacologic Agents to reduce the Risk of Pulmonary Aspiration. *Anesthesiology* 126 (2017): 376-93.
2. Smith I, Kranke P, Murat I, et al. European Society of Anaesthesiology. Perioperative fasting in adults and children: guidelines from the European Society of Anaesthesiology. *Eur J Anaesthesiol* 28 (2011): 556-69.
3. Anderson H, Zaren B, Frykholm P. Low incidence of pulmonary aspiration in children allowed intake of clear fluids until called to the operating suite. *Paediatr Anaesth* 25 (2015): 770-777.
4. Brady M, Kinn S, Ness V, et al. Preoperative fasting for preventing perioperative complications in children. *Cochrane Database Syst Rev* 7 (2009): 005285
5. Henriksen MG, Hesselov I, Dela F, et al. Effects of preoperative oral carbohydrates and peptides on postoperative endocrine response, mobilization, nutrition and muscle function in abdominal surgery. *Acta Anaesthesiol Scand* 47 (2003): 191-199.
6. Isserman R, Elliott E, Subramanyam R, et al. Quality Improvement Project to Reduce Pediatric Clear Fluid Fasting Times Prior to Anesthesia. *Paediatr Anaesth* 29 (2019): 698-704

7. Newton RJG, Stuart GM, Willdridge DJ, et al. Using quality improvement methods to reduce clear fluid fasting times in children in a preoperative ward. *Paediatr Anaesth* 27 (2017): 793–800.
8. Frykholm P, Schindler E, Sümpelmann R. Preoperative fasting in children: review of existing guidelines and recent developments. *Br J Anaesth* 120 (2018): 469-474.
9. Hamid S. Pre-operative fasting - a patient centered approach. *BMJ Qual Improv Rep* 5 (2014): 1252.
10. Arun BG, Korula G. Preoperative fasting in children: An audit and its implications in a tertiary care hospital. *J Anaesthesiol Clin Pharmacol* 29 (2013): 88-91.
11. Justine Mullie-Leger, Damien Lemaire, Valérie Deken, et al. Gestion de la durée du jeûne préopératoire dans un service de chirurgie pédiatrique : étude quantitative après modification du protocole de service. *Anesthésie & Réanimation* 7 (2021): 119-124.
12. Amengle L, Bengono R, Mbengono M, et al. Complications per et postopératoires en anesthésie pédiatrique dans deux hôpitaux de la ville de Yaoundé. *Revue Africaine de Chirurgie et Spécialités* 13 (2019): 16-20.
13. Illé S, Djafarou Abarchi B, Timi N, et al. Bilan de deux Ans d’Amygdalectomie au Service d’ORL et de Chirurgie Cervico-Faciale de l’Hôpital National de Niamey. *Health Sci. Dis* 19 (2018): 95-98.
14. Ndjolo A, Epossé EC, Bob Oyono JM, et al. La pratique chirurgicale ORL en milieu africain : une évaluation de cinq années et demie dans les hôpitaux de Yaoundé. *Médecine d’Afrique Noire* 53 (2006): 29-33.
15. Abdou Sy, Eric Joël RP, Mamady F, et al. L’amygdalectomie et adénoïdectomie à l’hôpital pour enfants de Diamniadio au Sénégal: une évaluation de 3 ans. *Health .Sci. Dis* 17 (2016): 50-54.
16. Dao OM, Ouedraogo WT, Ouedraogo B, et al. Amygdalectomie au Burkina Faso. *Médecine d’Afrique Noire* 53 (2006): 320-324.
17. Ahmed AO, Aliyu I, Kolo ES. Indications for tonsillectomy and adenoïdectomy: our experience. *Niger J Clin Pract* 17 (2014): 90-94.
18. Engelhardt T, Wilson G, Horne L, et al. Are you hungry? Are you thirsty? Fasting times in elective outpatient pediatric patients. *Pediatr Anesth* 21 (2011): 964–968.
19. Williams C, Johnson PA, Guzzetta CE, et al. Pediatric fasting times before surgical and radiologic procedures: benchmarking institutional practices against national standards. *J Pediatr Nurs* 29 (2014): 258–267.
20. Ragg P. Let them drink! *Paediatr anesth* 25 (2015): 762-763.
21. Frykholm P, Disma N, Andersson H, et al. Pre-operative fasting in children: A guideline from the European Society of Anaesthesiology and Intensive Care. *Eur J Anaesthesiol* 39 (2022): 4-25.