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Original Article

Preoperative fasting time in children undergoing elective surgical procedures

Tempo de jejum pré-operatório de crianças submetidas a procedimentos cirúrgicos eletivos

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Larissa Silva Bergantini[1]
Sueli Mutsumi Tsukuda Ichisato[1]
Mariana Salvadego Águila Nunes[1]
Carlos Alexandre Molena Fernandes[1]

[1]Universidade Estadual de Maringá.
Maringá, PR, Brazil.

Corresponding author:
Larissa Silva Bergantini
Avenida Colombo, 5790, Jardim Universitário,
CEP: 87020900. Maringá, PR, Brazil.
E-mail: larissasbergantini@gmail.com

RESUMO

Objetivo: verificar o tempo de jejum pré-operatório em crianças submetidas a procedimentos cirúrgicos eletivos. **Métodos**: estudo transversal, realizado com informações obtidas em 20 prontuários de crianças, submetidas à análise estatística descritiva e inferencial. **Resultados:** a mediana do tempo de jejum foi de 8,03 horas. O menor tempo registrado foi de sete horas e 45 minutos e o maior 17 horas e 30 minutos. Os escolares apresentaram maior tempo de jejum pré-anestésico. Em 16 casos, foi prescrito o jejum após a meia-noite. Não houve diferença estatística significativa entre tempo de jejum e as variáveis faixas etárias e especialidades cirúrgicas. Não se verificou nenhuma correlação entre a idade da criança e o tempo de jejum. **Conclusão:** a mediana do tempo de jejum foi inferior ao constatado em outros estudos. Os pacientes jejuaram por intervalos maiores do que o preconizado. Tempo de jejum não esteve relacionado com a faixa etária, especialidade cirúrgica e idade da criança.
Descritores: Jejum; Criança; Cirurgia Geral; Humanização da Assistência.

ABSTRACT

Objective: to verify the preoperative fasting time in children undergoing elective surgical procedures. **Methods:** cross-sectional study, carried out with information obtained from 20 children's medical records, submitted to descriptive and inferential statistical analysis. **Results:** the median fasting time was 8.03 hours. The shortest time recorded was 7 hours and 45 minutes and the longest 17 hours and 30 minutes. School children had the longest pre-anesthetic fasting time. In 16 cases, fasting after midnight was prescribed. There was no statistically significant difference between fasting time and the variables age groups and surgical specialties. No correlation was found between the child's age and fasting time. **Conclusion:** the median fasting time was shorter than that found in other studies. The patients fasted for longer intervals than recommended. Fasting time was not related to age group, surgical specialty, and age of the child.
Descriptors: Fasting; Child; General Surgery; Humanization of Assistance.

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Introduction

Among the preoperative care with the surgical child in elective procedures, one can mention preoperative fasting or pre-anesthetic fasting, considered as the period before a surgery during which patients are prohibited from ingesting solids or liquids[1]. The objective of preanesthetic fasting is to avoid regurgitation and consequent pulmonary aspiration of gastric contents by individuals undergoing anesthesia[2].

When performing a retrospective of the practice, it is verified that the traditional *nil per os* (NPO) - Latin expression meaning "nothing through the mouth" - after midnight emerged in the 60's, as a result of reports of occurrence of pulmonary aspiration associated with general anesthesia[3].

Currently, the practice of NPO after midnight has been challenged, and new scientific evidence supports and emphasizes the need to overcome it[4]. To this end, modern protocols, such as that of the *American Society of Anesthesiologists* (ASA), indicate the so-called 6-4-2 regimen, which provides for abstention from solid foods, breast milk and clear liquids (water and fruit juices without pulp, carbonated beverages, carbohydrate-rich nutritional drinks, clear tea and black coffee) respectively six, four and two hours before the surgical procedure and/or contrast-enhanced exams[1]. In addition, recent research points to even shorter fasting periods for clear liquids, such as one hour before surgery[5-6].

In front of this scenario, although a wide range of research supports the new guidelines for preoperative fasting, there seems to be a considerable gap between their practical application and what the evidence shows[7]. The incidence of pulmonary aspiration is low; however, patients continue to fast for excessively long and unnecessary periods[8-9], and it is possible to notice some resistance by the health services to implement the new fasting recommendations[9]. Pediatric patients end up suffering the consequences of prolonged fasting, among which are hypoglycemia, dehydration, sensation of hunger and thirst, discomfort, among others[3,9].

In Brazil, the project Accelerating Total Postoperative Recovery (ACERTO) aims to disseminate practices for total recovery of the surgical patient, including appropriate pre-anesthesia fasting, which is endorsed by the Brazilian Association of Pediatric Surgery (*Associação Brasileira de Cirurgia Pediátrica*) [9-10]. Despite that, in the country, similarly to what was mentioned above, the traditional fasting regimen seems to predominate in hospitals[11]. In addition, after a broad search in the national literature, it was detected that studies on the subject among the pediatric population in the nursing field are scarce, despite the important role of this category in perioperative care for children.

With this in mind, it is essential to evaluate the preoperative fasting time of children patients in the Brazilian context, in the light of recent protocols, particularly in the nursing field. Thus, the research question designed to guide this study was: what is the preoperative fasting time of children submitted to elective surgeries? Therefore, the objective was to verify the preoperative fasting time in children undergoing elective surgical procedure.

Methods

This is a cross-sectional study, which used documentary data, with a sample composed of 20 medical records of pediatric surgical patients hospitalized in the pediatric unit of a university hospital in northwestern Paraná, Brazil, between January 2016 and December 2017. The cross-sectional design is useful to assess the prevalence of a given phenomenon or disease in a group of individuals. Moreover, the exposure factors and the investigated outcome are measured at the same time[12].

The medical records of healthy children who underwent elective surgeries under general anesthesia or deep sedation and were admitted to the pediatric unit of the hospital were included. It is important to highlight that pediatric surgical patients who were in other sectors, such as emergency care, were not

included in the study. This decision aimed to ensure the quality of the data, since in the pediatric unit the notes, in general, are more accurate and richer in information.

Regarding exclusion criteria, the following were established: medical records of children subjected to surgical procedures with local anesthesia; affected by coexisting diseases or conditions that could affect gastric emptying or volume of stomach contents (obesity, diabetes, hiatus hernia, gastroesophageal reflux disease, intestinal obstruction, enteral nutrition such as nasogastric tube, gastrostomy, among others); submitted to emergency surgeries (Figure 1). Regarding the cases previously explained, the ASA guidelines may not apply and should be reconsidered or modified[1].

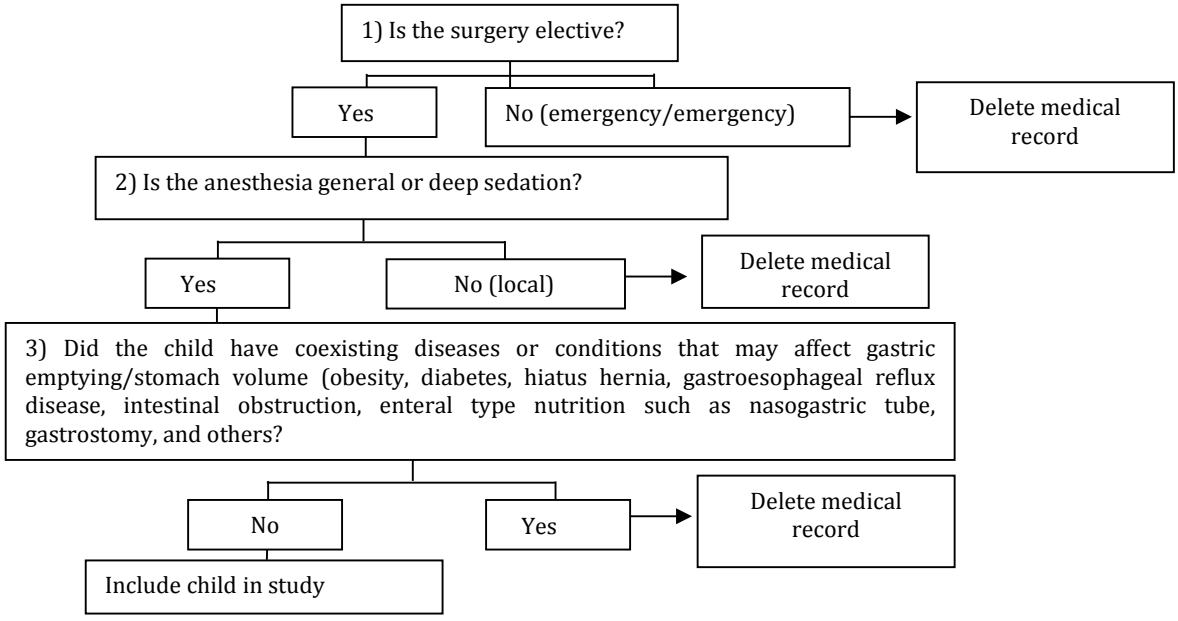

Figure 1 – Flowchart applied for selection of the sample of medical records according to established inclusion and exclusion criteria. Maringá, PR, Brazil, 2018

The survey of clinical and sociodemographic data of the children was performed using a data collection instrument consisting of two parts. The first contained data to characterize the patient (age, gender, weight, day of hospitalization, day of discharge, race/color and type of diet prescribed for the child) and the second was formed by the description of the surgical procedure (name of the surgical procedure, ASA physical status classification, type of anesthesia, operated organ, time of start of fasting, time of induction of anesthesia and type of fasting prescribed for the patient). The type of fasting refers to prescribing the NPO after midnight or performing a type-specific abstention time breakdown, as per the ASA guideline[1]. The ASA classification helps to predict perioperative risk and is divided into six levels, from ASA I to ASA VI[13]. Fasting time was determined from the time of onset of solid and liquid deprivation, recorded in the nursing and/or medical notes, until the moment of induction of anesthesia in the operating room reported by the professional in charge.

The data collected were compiled in Excel® for descriptive statistical analysis, namely, calculation of absolute and percentage frequency, median, mean, and standard deviation (SD), and were also submitted to inferential statistical analysis using the software R version 4.0.3. The Shapiro-Wilk test was performed to verify the normality of the data. To compare the fast-

ing time between the age groups of patients (newborn, infant, preschooler, schoolchild, and adolescent), the Kruskal-Wallis test was used. Finally, Spearman's Correlation Coefficient was used to check the relationship between the variable age and fasting time in hours, and the Mann-Whitney test was used to compare the pre-anesthetic fasting time according to the surgical specialties. For all the tests mentioned, a 5% significance level was considered.

The ethical aspects followed the bases of the Guidelines and Regulatory Standards for Research Involving Human Beings, according to Resolution 466/2012 of the National Health Council, and the research was approved by the Research Ethics Committee according to Opinion No. 2.754.668/2018.

Results

It was found that, in the years from 2016 to 2017, there were 1,235 hospitalizations in the pediatric unit of that institution. Among the hospitalized children, 443 underwent some type of surgical procedure, and only 115 of them were classified as elective. Of this number, only 20 children (about 17.0%) met the inclusion criteria and were entered into the study.

About the profile of the patients, it is noteworthy that 18 were male (90.0%). The average weight was approximately 16,382g, and the average age was 4.43 years. In 16 (80.0%) surgeries, NPO was prescribed after 00:00 (midnight). Four cases (20.0%) were exceptional, and NPO was required at times before 00:00: two surgeries with fasting prescribed after 11:00 p.m., one after 10:00 p.m., and one starting at 8:30 p.m.

In relation to the analysis of pre-anesthesia fasting time, the Shapiro-Wilk test showed that the data were not normal (p<0.001). The median identified was 8.04 hours, and the shortest time recorded was seven hours and 45 minutes and the longest was 17 hours and 30 minutes.

The age group that presented the longest time of abstaining from food was the schoolchildren, with a median of 9.83 hours of fasting. The other categories are shown in Table 1. It was verified by the Kruskal-Wallis test that there was no statistically significant difference between the preoperative fasting times in hours and the age groups of children (p=0.285). Similarly, based on Spearman's Correlation Coefficient (Rho), there was no statistically significant relationship between age in years and fasting time in hours in pediatric patients (Rho=0.33, p=0.149).

Table 1 – Frequency of elective surgeries and preoperative fasting time of pediatric patients according to age group. Maringá, PR, Brazil, 2018

Age group	Frequency		Fasting time (hours)	
	Absolute	Percentage	Average ± *SD	Median
Newborn (0 to 28 days)	0	0	-	-
Infant (29 days to <2 years)	7	35	8.14 ± 0.5	8.00
Preschool (≥ 2 to < 5 years)	6	30	9.67 ± 3.9	7.91
School (≥ 5 to < 11 years))	5	25	9.55 ± 1.6	9.83
Adolescent (≥11 to <20 years)	2	10	8.62 ± 1.2	8.62
Total	20	100	9.00 ± 2.3	8.04

*SD: Standard Deviation

All surgeries were conducted under general anesthesia. Furthermore, 14 participants (70.0%) were classified as ASA-II, and six (30.0%) as ASA-I. Infants were the patients who underwent the most surgical intervention (Table 1).

About the surgical specialties, it is noteworthy that half (50.0%) of the surgeries were in the otorhinolaryngology specialty, and the procedure belonging to oral maxillofacial surgery was the one that provided the longest fasting time to the child, with a mean of 17.50 hours (Table 2). This high number is justified by the cancellation and later scheduling of the surgery.

Considering the Mann-Whitney test, it was found that there was no statistically significant difference (p=0.405) between fasting time in hours and the surgical specialties "general surgery" and "otorhinolaryngology" (the specialty "oral and maxillo-facial"

was excluded because it has only one procedure). The most frequent surgery was cochlear implant, totaling nine procedures (45.0%), followed by surgical correction of hypospadias, with three cases (15.0%).

Table 2 – Frequency of surgeries according to specialty and pre-anesthetic fasting time. Maringá, PR, Brazil, 2018

Specialty	Frequency		Fasting time (hours)	
	Absolute	Percentage	Average ± *SD	Median
General surgery	9	45	8.52 ± 1.4	7.83
Otorhinolaryngology	10	50	8.58 ± 0.8	8.12
Oral Maxillofacial	1	5	17.50	17.5
Total	20	100	9.00 ± 2.3	8.04

*SD: Standard Deviation

Discussion

As limitations of the present study, the small sample size and the lack of detailing of the preoperative fasting conditions in the notes present in the patients' charts are cited. In addition, possibly due to the strict inclusion criteria determined to enable analogy with the ASA recommendations, many records of surgical children were not included in this analysis.

It is expected that the results of this study will boost the evidence-based practice, overcoming old-fashioned actions, without scientific support, in favor of a high level of quality care and caring for the client's safety. Future investigations are necessary to obtain information about correlations between pre-anesthesia fasting and postoperative outcomes.

The results of this research showed that pediatric patients fasted for a prolonged time, which is not consistent with the guidelines recommended by the ASA about the 6-4-2 model for solid foods, breast milk and clear fluids, respectively. Infants were the ones who had the most surgical intervention. In this sense, it is indicated that infants fed with breast milk and infant formula can receive these foods up to four and six hours before the elective surgical procedure, respectively[1].

Regarding the median time of pre-anesthetic fasting, the results of the present study were lower than those of two studies that reported a mean of 9.43 hours of fasting for solids[14], nine hours of abstaining from light meals and 14 hours of fasting for larger meals[15]. Still, other authors identified an average of 11.7 hours of deprivation of solid foods[16].

Similarly, the median of 8.04 hours found in this study was lower compared to the mean of 14 hours for longer meals and 9.3 hours for light meals in elective procedures obtained in a multicenter study involving 12,093 children in Germany and the Netherlands. In addition, the analysis revealed that among the group of pediatric patients who underwent elective surgical interventions, prolonged pre-anesthetic fasting for major meals and light ingestions was observed in 85.6% and 45.0% of the cases, respectively[8].

Furthermore, it is admitted that the median of 8.04 hours of pre-anesthetic fasting of the 20 pediatric patients in this study probably represents an underestimated value, since it is based on the medical prescription and not exactly on the time of the last food intake of the patient. It is believed that there are deficits and gaps in the notes of the healthcare team that lead to underestimation of the pre-anesthetic fasting times as found in this study. There was a lack of specific data about the child's last meal and fasting time. This information is relevant for assistance and is part of the recommendations of the Federal Council of Nursing for the nursing record regarding the preoperative period[17]. Furthermore, it is noteworthy that detailed notes provide benefits not only for the assistance provided to the patient itself, assisting in the continuity of care, but also provide information based on which health indicators can be elaborated, enabling the analysis of the assistance that is being provided in the institution[18].

Based on these results, it was possible to notice that the hospital still used the traditional NPO after midnight and did not distinguish the fasting time according to the type of food (solids, infant formula, etc.) as recommended[1,10], except for human milk, in

which normally the fasting time is differentiated. It was also verified a professional practice that did not allow patients to ingest clear liquids in the two hours before the surgical procedure. In a study evaluating 16 Brazilian hospitals, the practice of traditional fasting or NPO after midnight was adopted in 12 (75.0%) institutions[11].

Considering the median fasting time of this study and considering that the last meal of the child was composed of solids and a light meal (supper), usually consisting of tea and crackers, it is believed that the patients fasted about two hours longer than recommended by the American anesthesia guidelines regarding the intake of solids (six hours)[1]. Similarly, given the abstention of clear liquids (two hours), one can assume that pediatric clients fasted approximately six hours longer considering the same protocol. An analysis carried out in Brazil revealed that about 50.0% of the individuals evaluated underwent anesthesia after more than 12 hours of fasting[11].

The present study found no statistically significant difference between fasting time and age groups of pediatric patients and no correlation between age in years and pre-anesthesia fasting time. These results are in agreement with a research by Brazilian authors who concluded that age did not influence fasting time before surgery in adult subjects[11]. Antagonistically, in a study in Sweden, it was found that when compared to children under three years of age, older pediatric clients were less likely to fast for six hours or more[6].

The observed trend of longer fasting intervals at younger ages can be explained by the fact that children under one year of age often drink only breast milk or infant formula, abstaining from these foods for four hours or more[6]. The result of no statistically significant difference between fasting time in hours and surgical specialties converges with a study that observed that the type of surgery did not impact the fasting time of clients[11].

The results of this research endorse the frequently reported gap between evidence-based theory and practical application in day-to-day health care services[2-8]. There are several factors that hinder the implementation of recent protocols, such as the lack of reliable information about the start time of surgery, the occurrence of acute or emergency cases, the transmission of equivocal or unclear instructions to patients or parents, the misunderstanding of recommendations, among other issues[8]. Moreover, the NPO regimen after midnight seems to be more feasible and simpler to follow and is hardly misunderstood by clients[2].

Thus, the dichotomy of pre-anesthesia fasting should be reflected upon, that is, the need to prevent pulmonary aspiration and the harmful effects of prolonged fasting[16]. Pulmonary aspiration of stomach contents, however, is considered rare, with an incidence of one to ten cases in 10,000 children. In addition, the ingestion of clear liquids one to two hours before anesthesia does not seem to affect gastric volume or pH[6], and an empty stomach is a condition that can be expected, but not guaranteed, regardless of the chosen fasting regimen[15].

However, it is not denied that there are conditions or comorbidities that may affect gastric emptying, such as pregnancy, obesity, diabetes, hiatus hernia, gastroesophageal reflux disease, among others. In these cases, recommendations should be reevaluated and even modified, since they may represent an increased risk of pulmonary aspiration[1], although the anesthetic technique seems to be the most relevant factor to reduce the chances of its occurrence. In such circumstances, a judicious evaluation by the anesthesiologist is required to adapt the guidelines, judging them applicable or not[4].

On the other hand, children are more sensitive to fasting than adults because of their reduced glycogen stores in the liver and skeletal muscle. The literature also argues that the younger the child, the more rapidly hypoglycemic and ketogenic conditions can develop[6]. In addition, exacerbated fasting may elevate insulin resistance postoperatively, with increased risk for complications and prolonged hospitalization[5]. Pediatric patients allowed to drink clear liquids in the period close to surgery experienced less thirst, hunger, and anxiety[6].

Aiming to translate the scientific knowledge concerning fasting to the daily practice in health institutions, it has been emphasized, in general, measures with a multi-professional approach aiming to approximate the current guidelines[15]. In this aspect, it is highlighted that the effective and frequent communication among nurses, surgeons, anesthesiologists and other team members seems to contribute to shorten the period of solids and liquid deprivation, which is since surgical procedures are subject to be postponed or even canceled, and the dialogue enables the adaptation of the patient's fasting time, if necessary[11,19].

Chinese researchers who sought to evaluate the impact of implementing an individualized preoperative fasting program on children's time to abstain from food found that the relatively accurate estimation of the surgery time from the confirmation of the surgical schedule was crucial in the proposed program. In addition, the administration of clear liquids in the two hours preceding surgery was effective in reducing the fasting time, which was facilitated by accurate assumption of the starting time of the procedure[20]. Some authors argue that even more flexible regimens for deprivation of clear fluids (one hour before surgery) would be important in reducing the pre-anesthetic fasting period, since even with two-hour models of abstaining these fluids, patients end up fasting excessively[19].

Continued education of health professionals, especially physicians, about modern protocols is recommended[6,19], as well as the elaboration of standard operating procedures that can support the conduct of the interdisciplinary team within hospitals[15,19].

Finally, guidance about preoperative fasting directed to parents or caregivers of the pediatric client is essential for compliance with the appropriate periods of solids and liquid deprivation[20]. Thus, the conversation between professionals and those responsible for the patient can simultaneously prevent exacerbated periods of fasting, justified by the lack of understanding about this practice, as well as by the belief that the longer the fasting time, the greater the benefit to the child[9,20].

Conclusion

The median preoperative fasting time for pediatric patients identified in this research was lower than the numbers found in other studies. Still, the children fasted for an excessive amount of time compared to current guidelines. There was no statistically significant difference between fasting time and the variables age groups of the child patients and surgical specialties. Also, there was no correlation between the child's age in years and pre-anesthetic fasting time.

Collaborations

Bergantini LS and Ichisato SMT contributed to the conception of the project, analysis and interpretation of data, writing of the article, and final approval of the version to be published. Nunes MSA contributed to the analysis and interpretation of data and article writing. Fernandes CAM contributed to the analysis and interpretation of data and relevant critical review of the intellectual content.

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