© Malaysian Journal of Anaesthesiology 2026; 5:11-24
Review article
https://doi.org/10.35119/myja.v5i1.137

Preoperative fasting in Asian children: evidence, context, and the path to region-specific guidance

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Abstract

Preoperative fasting guidelines have evolved substantially over three decades, moving from rigid nil-per-os-after-midnight directives to evidence-based regimens permitting clear fluids within one to two hours of induction. However, most supporting evidence originates from Western high-income settings, raising concerns about its applicability to Asian paediatric populations. This narrative review examines the evidence base for preoperative fasting in Asian children, the contextual factors that shape its practice across the region, and the path toward region-specific guidance. Four integrated lenses are applied: the physiology of gastric emptying and aspiration risk; the evolution of major international fasting guidelines; the persistent problem of prolonged fasting in clinical practice; and the cultural, dietary, and climate considerations that render the Asian context distinctly different from the settings in which current guidelines were conceived. Pulmonary aspiration during elective paediatric anaesthesia is exceedingly rare, fewer than

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three to four events per 10,000 cases, yet actual clear fluid fasting durations of eight to twelve hours remain common across Asian centres. Three evidence gaps of particular regional significance are identified: uncharacterised gastric emptying profiles of rice-based staple meals in children; nutritional vulnerability of paediatric patients in lower-middle-income Asian settings; and the potential interaction between prolonged fasting and climate-driven heat exposure across South and Southeast Asia. Although current international fasting principles remain physiologically sound, their implementation in Asia requires dedicated research on regional diets, consensus guidelines developed by Asian anaesthesiology societies, and institutional strategies to reduce unnecessary fasting. A multinational survey currently underway aims to support a future Delphi-based regional consensus.

Keywords: Asian children, gastric emptying, paediatric anaesthesia, preoperative fasting, pulmonary aspiration

Introduction

Preoperative fasting is defined as the intended period of starvation prior to administering any modality of anaesthesia. It is one of the oldest and most universally applied yet inconsistently implemented practices in anaesthesia. Born from the imperative to prevent pulmonary aspiration under general anaesthesia, fasting instructions have evolved considerably over the past three decades, moving from the rigid "nil per os (NOS) after midnight" dogma to increasingly liberal, evidence-based regimens that now permit clear fluids as little as one to two hours before induction. The scientific rationale for this liberalisation is well established: clear fluids are rapidly emptied from the stomach, pulmonary aspiration in healthy children undergoing elective surgery is exceedingly rare, and the harms of prolonged fasting —including dehydration, hypoglycaemia, and perioperative distress—are neither trivial nor uncommon. Nevertheless, the evidence base underpinning current recommendations has been derived predominantly from Western, high-income healthcare settings, raising questions about their direct applicability to diverse healthcare systems and paediatric surgical populations.

To date, few preoperative fasting guidelines have been developed specifically for Asian paediatric populations by researchers working within the region.[1] Asia-specific considerations, including rice-based dietary staples, spiced and herb-containing foods, traditional herbal drinks, and the high prevalence of childhood undernutrition, are highly clinically relevant but remain poorly studied in this context. Socioeconomic disparities and heterogeneous health system capacities across Asian countries further complicate both the development and implementation of con-

text-appropriate fasting guidance. The gap between what the evidence supports and what routinely happens in our operating theatres, therefore, reflects not merely inadequate guideline dissemination, but deeper structural, cultural, and dietary realities that existing international frameworks developed primarily in high-income Western settings were not designed to address.

This narrative review examines preoperative fasting in Asian children through four integrated lenses: (i) the physiology of gastric emptying and aspiration risk that underpins all fasting recommendations; (ii) the evolution of international fasting guidelines and the evidence driving their progressive liberalisation; (iii) the persistent problem of prolonged fasting in clinical practice and the barriers that sustain it; and (iv) the cultural, dietary, and climate-related considerations that render the Asian context distinctly different from the settings in which current guidelines were conceived. Taken together, these perspectives support the conclusion that while international evidence-based fasting principles remain broadly relevant, their translation into effective practice in Asia requires adaptation and implementation strategies that are attentive to cultural, institutional, and systemic factors.

Physiology of gastric emptying and aspiration risk in children

The absence of a protective gag and cough reflexes in an anaesthetised patient mandates the importance of preoperative fasting in preventing pulmonary aspiration. Understanding the mechanisms of gastric emptying is therefore essential when determining appropriate fasting intervals.[2] Ingested solid food undergoes slower, approximately linear gastric emptying. Solid food must be mechanically reduced to particles smaller than 1–2 mm, resulting in prolonged emptying times of up to 6 hours.[3-5]

Generally, clear fluids demonstrate rapid, exponential gastric emptying, with a half-life of approximately 10–15 minutes and negligible residue after one hour. The gastric emptying rate increases with the volume and rate of clear fluid intake. Breast milk, a complex emulsion of fat and protein, empties more slowly, typically within two to three hours. Formula milk, with its larger casein curds and higher caloric density, prolongs gastric emptying to three to four hours. This understanding of gastric physiology underpins the 6-4-3-1 rule for preoperative fasting in paediatric patients.[6]

Several factors have been identified as influencing gastric emptying. Although age was historically considered important, primarily because of immature

gastric motility in neonates, a large model-based meta-analysis found no clinically meaningful difference in gastric emptying rates across age groups from premature neonates through to adults, identifying meal composition as the primary determinant. [7] Conditions that compromise lower oesophageal sphincter competence, including neuromuscular disease, morbid obesity, hiatal hernia, and gastro-oesophageal reflux disease, as well as opioid premedication, which may inhibit gastric neural pathways, are established risk factors for delayed gastric emptying and increased aspiration risk.[2,8] Of particular relevance to Asian clinical practice, there is currently insufficient evidence to determine how commonly consumed culinary preparations, including spice-rich dishes, specific herbal teas, and traditional medicinal drinks can affect gastric emptying rate and residual volume. This represents an important evidence gap that prospective studies should prioritise, as findings will directly inform whether existing fasting intervals require modification for Asian paediatric populations.

Pulmonary aspiration during elective paediatric anaesthesia is exceedingly rare, with an estimated incidence of fewer than 3 to 4 events per 10,000 cases; clinically significant harm from clear-fluid aspiration is rarer still.[9,10] Ultimately, preoperative fasting recommendations should be viewed as risk-mitigation strategies rather than absolute rules, and they should be weighed against the harms of prolonged fasting. In ambiguous cases involving fasting status or suspected delayed gastric emptying, gastric ultrasound (GUS) provides validated point-of-care evidence to guide individualised decision-making.[3]

Evolution of guidelines: evidence for the fasting norms

Preoperative fasting guidelines are systematically developed recommendations intended to support clinical decision-making and improve perioperative outcomes. They are directed primarily at healthy patients scheduled for elective procedures. Their evolution over more than a century reflects the progressive integration of physiological evidence, clinical observation, and patient-centred values into perioperative care.

Preoperative fasting has evolved from strict, ritualistic doctrines to patient-centred, evidence-based practice that balances the physiological stress of starvation against the risk of pulmonary aspiration. The death of 15-year-old Hannah Greener in 1848 during a toenail removal under chloroform anaesthesia is widely recognised as a pivotal moment in the history of preoperative fasting, although her death was not attributed to aspiration alone.[11] Subsequent observations culminated in Sir Joseph Lister's 1883 recommendation that patients consume a cup of beef tea two

hours before anaesthesia was one of the earliest documented distinctions between solid food and clear fluid fasting intervals.[12] Subsequently, Curtis Mendelson's 1946 paper described severe chemical pneumonitis resulting from gastric acid aspiration in obstetric patients.[13] The NPO after midnight rule was widely adopted thereafter, despite limited empirical support. In 1974, Roberts defined 0.4 ml/kg body weight, approximately 25 ml in an adult, as the "critical gastric volume" for aspiration risk.[14] The first formal consensus-based perioperative fasting guideline was published by the Norwegian Society of Anaesthesiology.[15]

Recommendations of major international guidelines

The Helsinki Declaration on Patient Safety in Anaesthesiology established patient safety as a foundational principle of perioperative practice and provided the institutional framework for subsequent fasting guidelines to be developed and disseminated.[16] Within this framework, recommendations have evolved most rapidly in the area of clear fluid intake, where the supporting physiological evidence is strongest and the harms of prolonged fasting most clearly documented.

Clear fluids: from the two-hour rule to "sip-till-send"

Clear fluid refers to fluid through which a newspaper can be read, encompassing water, coffee and tea without milk, carbohydrate drinks, and juice or coconut water without pulp. The 1999 American Society of Anaesthesiologists (ASA) guidelines formalised the two-hour rule,[17,18] allowing clear liquids up to two hours before elective procedures. The 2023 ASA modular update retained clear liquids up to two hours before elective procedures, while acknowledging emerging paediatric evidence on shorter clear-fluid fasting intervals.[18] In contrast, the 2022 European Society of Anaesthesiology and Intensive Care (ESAIC) guidelines[6] and the 2023 Canadian Anesthesiologists' Society (CAS) guidelines[19] support a one-hour fasting period for clear fluids in children. The "sip-till-send" (STS) approach, which permits clear fluid intake until the child is called to the operating suite, has gained traction in UK paediatric practice and is acknowledged by the 2022 ESAIC guidelines as a feasible alternative for centres able to operationalise it.[6] Reported benefits include reductions in thirst, hunger, irritability, and perioperative anxiety, with no signal of increased aspiration risk in published series.[10]

Breast milk and infant formula

The 6-4-2 rule, established in 1999, mandated a four-hour fast for breast milk and a six-hour fast for solids or infant formula. The 2022 ESAIC guidelines updated the breast milk fasting requirement to three hours,[6] acknowledging that breast milk empties faster than formula. Infant formula continues to require a four- to

Table 1. Shifting guidelines for paediatric populations

Fasting category	1999 & 2023 ASA (hours)	2022 ESAIC/2023 CAS (hours)
Solid food	6	6
Infant formula	6	4
Breast milk	4	3
Clear fluids	2	1 (or sip-till-send)

ASA: American Society of Anesthesiologists; CAS: Canadian Anesthesiologists' Society; ESAIC: European Society of Anaesthesiology and Intensive Care.
Note: While the 2022 ESAIC and 2023 CAS guidelines support a 1-hour fasting interval for clear fluids in children, the 2023 ASA modular update retained the traditional 2-hour recommendation for clear liquids before elective procedures, while acknowledging emerging evidence supporting shorter fasting intervals in selected paediatric settings.

six-hour fast depending on the region and the age of the child. The evolution of recommended fasting intervals across major guideline bodies for each intake category is summarised in Table 1.

Light versus heavy meals

International guidelines generally define a light meal such as toast with a clear liquid, as requiring a six-hour fast, whereas heavy meals containing fried foods, fatty foods, or meat require eight or more hours given that fat and protein significantly delay gastric emptying.[2,8] Importantly, these definitions were derived from Western dietary compositions and may not adequately capture the gastric emptying profile of Asian staple foods, a limitation addressed further below.

Modern optimisation: carbohydrate loading

Current trends, driven by enhanced recovery after surgery (ERAS), emphasise preoperative carbohydrate loading. Administering carbohydrate-rich drinks, such as maltodextrin-containing clear fluids, up to two hours before surgery has been shown to reduce insulin resistance, thirst, and hunger. Recent paediatric guidelines in several settings indicate a move toward more liberal fasting regimens, including the 6-4-3-1 approach, in which appropriate clear fluids are permitted until one hour before anaesthesia, while prioritising patient comfort and metabolic stability as key components of perioperative safety.

The persistent problem of prolonged fasting in clinical practice

Despite decades of guideline development, prolonged preoperative fasting remains common in paediatric surgical practice worldwide, including across many Asian healthcare systems. Multiple studies report actual clear fluid fasting durations of 8–12 hours in children, far exceeding the guideline-recommended one to two hours.[20,21] Evidence from Asian centres is consistent with this global pattern. Observational studies from India and Thailand report that children undergoing elective surgery frequently fast well beyond recommended intervals, with median fasting durations commonly exceeding eight hours. [22,23] A prospective observational study from Thailand found that the median actual fasting durations for clear fluids and solids were 8.5 and 12.9 hours, respectively, with hunger and thirst reported as the most common perioperative complaints.[22] This persistent discrepancy between recommended and actual fasting durations is summarised in Figure 1, which illustrates the implementation gap across key fasting categories in Asian paediatric practice.

Fig. 1. Implementation gap in paediatric fasting practice.

A recent systematic review and meta-analysis reported that prolonged preoperative fasting is associated with lower perioperative blood glucose levels in children undergoing elective surgery. [23] These findings highlight a persistent and measurable gap between guideline intent and real-world perioperative care. Table 2 presents a comparison of guideline-recommended and commonly observed fasting durations across intake categories in children undergoing elective surgery, highlighting the magnitude of this gap.

In many Asian healthcare settings, several structural and cultural factors contribute to this discrepancy. A conservative safety culture remains influential, with clinicians and ward staff often prioritising avoidance of aspiration risk over the potential harms associated with unnecessary fasting.[6] In hierarchical healthcare environments, traditional practices such as NOS after midnight may persist even when updated guidelines are available.[12] Unpredictability in operating theatre

Table 2. Recommended versus observed fasting durations in paediatric elective surgery[6,19-21]

Intake type	Guideline recommendation (hours)	Commonly observed duration (hours)
Clear fluids	1–2	6-12
Breast milk	4	6-10 h
Infant formula / light meal	6	8–12
Fatty meal	8	> 12

schedules is another important contributor. High surgical volumes in tertiary referral centres, combined with emergency case insertions and delays in preceding operations, frequently lead staff to recommend earlier fasting cut-off times.[20,21] Fasting instructions communicated through multiple intermediaries such as surgeons, ward nurses, and administrative staff, are further vulnerable to escalation into overly conservative guidance.[24]

Healthcare delivery structures may also influence fasting practices. In many Western healthcare systems, elective paediatric surgery is organised through day-of-surgery admission programmes with coordinated perioperative pathways.[25] In contrast, in many Asian hospitals, fasting instructions may be delivered through surgical wards and multiple intermediaries rather than through integrated perioperative pathways. This fragmented communication, together with parental fear of surgical cancellation, may contribute to deliberately conservative fasting behaviour and unnecessary over-fasting.

Prolonged fasting is not without consequence. Children commonly experience hunger, thirst, irritability, dehydration, and occasionally hypoglycaemia, which may increase perioperative distress and complicate anaesthetic management.[26] Younger children appear particularly vulnerable because of limited metabolic reserves. Children with obesity, autism spectrum disorder, or Down syndrome may face additional physiological or behavioural challenges when fasting is extended. These observations underscore a key implementation principle: guideline dissemination alone rarely changes practice. Reducing unnecessary fasting requires coordinated institutional strategies, including standardised fasting protocols, improved parental education, and closer collaboration between surgical wards and anaesthesia teams.[27]

Implementation barriers and clinical implications

Data directly quantifying fasting practice and its consequences in Asian paediatric populations remain limited but are growing. Available studies from Asian centres consistently indicate that children frequently fast substantially longer than recommended, particularly for clear fluids, and that prolonged fasting is associated with hunger, thirst, parental concern, and lower perioperative blood glucose levels.[22,23]

Strategies for optimising fasting compliance

Effective guidelines require effective implementation. Many centres continue to experience inadvertently prolonged fasting because of scheduling unpredictability and fragmented communication. Evidence-informed strategies to reduce unnecessary fasting include:

- **Active communication:** Provide structured written and text message-based fasting instructions to parents on the day before surgery, with explicit permission for clear fluids until one to two hours before the scheduled procedure time.
- **Staff and parental education:** Deploy infographics, short videos, and targeted education sessions for ward staff, surgeons, and parents to address persistent misconceptions about aspiration risk and the safety of liberal clear-fluid policies.
- **Prescriptive fluid orders:** Treat clear fluid intake as a formal perioperative prescription (analogous to "THINK DRINK" campaigns) to ensure active administration of fluids upon admission rather than passive continuation of unnecessary fasting.
- **Multicentre audit and feedback:** Implement coordinated regional audits to prospectively monitor fasting compliance, identify system-level barriers, and evaluate the impact of quality improvement interventions.
- **Gastric ultrasound:** Integrate GUS as a clinical decision-support tool in both elective and urgent cases, particularly when fasting status is uncertain, gastric emptying may be delayed, or individualised risk stratification is required.

The Asian context: cultural, dietary, and climate considerations

The evidence reviewed in the preceding sections establishes that prolonged fasting is harmful, that liberalisation is safe, and that the gap between guidelines and practice is a near-universal problem. What those sections do not address is why that gap is wider, deeper, and more structurally entrenched in Asia than elsewhere. The dominant frameworks produced by the ASA and the ESAIC, were developed from evidence generated largely in high-income, Western settings.[6] Applying these normative standards to Asian children without interrogating the cultural, dietary, and climate differences that define our practice environment represents a significant and largely unacknowledged gap in perioperative care.

Cultural considerations

In our multilingual, multiethnic societies, preoperative fasting instructions are frequently communicated across language barriers and varying levels of health literacy. Parents and caregivers who do not fully understand the rationale for permitting clear fluids close to induction are more likely to interpret the instruction conservatively, prolonging the fast out of caution. Studies of parental understanding and compliance with fasting instructions show that unclear or conflicting instructions and fear of cancellation can contribute to non-compliance and over-fasting.[28] This is a communication failure as much as a knowledge gap, and it demands culturally adapted, language-appropriate patient education rather than a standard instruction sheet applied uniformly across diverse populations.

Dietary considerations

The most directly evidence-relevant dietary issue for Asian paediatric anaesthesia is the gastric emptying profile of the rice-based meals. Rice is the primary dietary staple for more than half the world's population, concentrated predominantly in Asia.[29] The impact of spice-rich prepared foods on gastric emptying also requires investigation. Current guidelines apply a six-hour fasting interval for a light meal, a standard defined based on Western food compositions such as toast and a light sandwich. A prospective ultrasonographic study by Cho *et al.* found that the average gastric emptying time for a rice-based meal was 5.8 hours, with an upper confidence interval of 6.5 hours, leading the authors to conclude that fasting time after an Asian meal should be at least 6.5 hours.[30] Crucially, these data were derived from adult

volunteers. No paediatric-specific data on gastric emptying of Asian staple foods currently exist, leaving clinicians to extrapolate across both a population and a dietary difference simultaneously.

The issue of nutritional vulnerability deserves equal attention. In lower-middle-income Asian countries, childhood undernutrition remains prevalent, and a child who arrives in the operating theatre after a prolonged fast with limited baseline glycogen reserves faces a substantially higher risk of perioperative hypoglycaemia than a well-nourished child in a Western setting.[31] This interaction between institutional over-fasting and nutritional vulnerability defines a harm profile that is distinctly Asian and remains absent from current international guideline discussions.

Climate crisis: an emerging concern

The intersection of climate-related heat exposure with paediatric perioperative care is an emerging but still underexplored dimension of the Asian context. South Asian, Southeast Asian, and Middle Eastern populations are projected to face severe paediatric heat exposure under all greenhouse gas emission scenarios.[32] Children may be more physiologically vulnerable than adults because of their higher body-surface-area-to-mass ratio, immature thermoregulation, and limited ability to recognise and respond to thirst. In theory, rising ambient temperatures, more frequent heatwaves, and prolonged hot seasons could increase the dehydration burden of prolonged preoperative fasting, particularly in surgical units without reliable climate control. However, direct evidence linking ambient heat exposure, fasting duration, and perioperative outcomes in children remains limited. This potential interaction should therefore be regarded as a research priority rather than an established clinical association.

Conclusion

International fasting principles grounded in gastric physiology remain scientifically sound. However, their direct application to Asian children is constrained by a significant absence of context-specific evidence. The cultural heterogeneity of Asian societies, the uncharacterised gastric emptying profiles of rice-based staple meals in children, the nutritional vulnerability of paediatric patients in lower-middle-income settings, and the potential effect of climate-related heat exposure are not peripheral considerations. They are important contextual factors that are insufficiently addressed in major international guidelines currently in use. Addressing this

gap requires dedicated physiological research, region-specific recommendations developed by Asian anaesthesiology societies, and health system reforms that dismantle the structural drivers of over-fasting. A multinational survey of fasting practices across Asian paediatric centres is currently in progress and will provide an empirical foundation for a Delphi-based regional consensus. Asian children deserve fasting guidance that reflects the realities of their diets, health systems, and perioperative environments.

Declarations

Competing interests

Dr. Ina Ismiarti Shariffuddin is Chief Editor of Malaysian Journal of Anaesthesiology (MyJA). She was not involved with any part of the publication process prior to acceptance. MyJA conducts double-blind peer review.

Funding

None to declare.

Acknowledgements

None to declare.

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