Parenteral and enteral nutrition for pediatric oncology in low- and middle-income countries

Viani K
Department of Hematology-Oncology, Institute of Treatment of Childhood Cancer, Institute of the Child, Clinics Hospital, School of Medicine, University of Sao Paulo, Sao Paulo, Brazil

Abstract
Although nutritional therapy is essential for the treatment of childhood cancer, it remains a challenge, especially within the developing world, where there are many barriers to optimizing treatment. The oral route is the first approach to nutritional support, however challenging this might be in children with cancer. Oral supplements are indicated in moderate evaluated nutritional risk patients and its use should consider the family’s social conditions and access to industrialized oral supplements. If unavailable, homemade oral supplements can be used respecting regional accessibility, local foods, and culture. Nonetheless, many patients cannot sustain nutritional status on oral feeding alone and need to be supported by enteral tube feeding. Enteral feeding may be modified to accommodate the financial constraints of institution in low- and middle-income countries (LMICs). In some oncologic situations, however, enteral nutrition is not possible and parenteral nutrition is indicated, although only if the need for nutritional support is anticipated to be longer than 5–7 days. Nutritional support in pediatric oncology remains a challenge, especially in LMICs, however, it can be undertaken by getting the best out of the available resources.

Key Words: Enteral and parenteral nutrition, low- and middle-income countries, nutrition, pediatric oncology

Introduction
Nutritional therapy is an essential component of the treatment of childhood cancer and therefore should be regarded as an important part of it, especially within the developing world, largely due to the magnitude of malnutrition within these countries. Most children with cancer reside in low- and middle-income countries (LMICs), where there are many barriers to optimizing treatment. This article highlights some current approaches to nutritional therapy in LMICs.

Oral Supplementation
The oral route is the first approach to improve the nutritional status. However, this might be challenging in pediatric oncology patients due to the side effects associated with cancer and cancer therapy. Oral supplements provide macronutrients and micronutrients with the aim of increasing oral nutritional intake and should be high in those nutrients so that there is less volume intake necessary to meet nutritional needs.[1]

Oral supplements are indicated if the patient has a moderate evaluated nutritional risk – for which you should consider diagnosis, intensity of treatment, gastrointestinal tract symptoms, decreased energy intake, weight loss, and body size – or if impending treatment will adversely affect nutritional status and ability to meet needs orally.[2]

When it comes to recommending oral supplements, some factors should be considered, such as center’s and/or family’s social conditions and access to industrialized oral supplements. Commercial supplements can be helpful in promoting nutritional intake, but can also be expensive, unavailable or not well accepted. For example, a descriptive study conducted in Sao Paulo, Brazil, found that homemade nutritional formulas were economical, well accepted among children, and adolescents with cancer and achieved adequate nutritional composition.[3] The use of homemade supplements should rely on regional accessibility and local foods, respecting the local culture. Some examples used in Brazil are dry milk, soy milk powder, cassava and corn flour, yogurt, honey, coconut oil, egg white, fruits, nuts, and vegetables. There is also ready-to-use therapeutic foods (RUTFs), designed to provide high protein and energy content and essential micronutrients. These food supplements are easy to distribute and can be used in difficult environments; however, their use may be limited by availability and patient acceptance, especially commercial international RUTFs. Some suggest a local production of RUTFs, which can be prepared in needed quantities, are more affordable, and more likely to be accepted by patients, especially in India, since the flavors can be adapted to local culture. Table 1 illustrates some RUTFs locally produced and used in India.[4]

Enteral Tube Feeding
Unfortunately, many pediatric patients on oral diet alone have significant weight loss and muscle wasting and need to be supported by other means. Enteral tube feeding (ETF) for the pediatric oncology population has been demonstrated to be feasible and safe, in addition to promote weight gain.[5-9]

Some indications to the use of ETF include malabsorption, increased nutrition requirements, inability to meet needs orally, and dysphagia. It should also be considered in patients with over 5% weight loss or crossing more than two percentile channels, and in patients meeting <80% of estimated nutritional needs through oral intake added to the expectation of improving treatment to adversely affect the nutritional status and/or the ability to meet needs orally. If the use of ETF is expected to be more than 4–6 weeks to 3 months, an ostomy is indicated.[2,10]

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Viani K. Parenteral and enteral nutrition for pediatric oncology in low- and middle-income countries. Indian J Cancer 2015;52:182-4.
Table 1: Locally produced ready-to-use therapeutic foods in India

<table>
<thead>
<tr>
<th>Name of mix</th>
<th>Composition and nutritional value</th>
<th>Developed by</th>
<th>Locally prepared by</th>
<th>State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Davangere mix</td>
<td>Laddus made of equal quantities of groundnuts, roasted Bengal gram, jaggery, and ragi. 100 g gives 400 kcal and 15 g protein</td>
<td>Medical College, Davangere</td>
<td>Women’s groups</td>
<td>Karnataka</td>
</tr>
<tr>
<td>Shakti nutrimix</td>
<td>Rice, wheat, whole gram (chana), ground nut, sugar, salt, cardamom, black pepper, vitamins, and minerals. 100 g provides 10.4 g protein, 5.3 g fat and 402 kcal</td>
<td>Shibipur People’s Care Organization</td>
<td>Women’s groups</td>
<td>West Bengal</td>
</tr>
<tr>
<td>Nutrimix</td>
<td>Wheat (400 g), rice (400 g), grams (75 g), moong (75 g), groundnut (50 g); sprouted, dried, roasted and powdered. 2 heaped spoons in glass of water or milk with sugar twice a day</td>
<td>Development Research Communication and Service Center</td>
<td>Women’s groups</td>
<td>West Bengal</td>
</tr>
<tr>
<td>Nutrimix</td>
<td>Wheat/rice and Bengal gram/moong in ratio 4:1. 100 g cooked provides 120-150 kcal and 2-3 g protein</td>
<td>Child In Need Institute, Kolkata</td>
<td>Women’s groups</td>
<td>West Bengal</td>
</tr>
<tr>
<td>Lapsi</td>
<td>Green millet, peanut, jaggery</td>
<td>Bharat Agro Industries Foundation and CAPART</td>
<td></td>
<td>Maharashtra</td>
</tr>
<tr>
<td>SAT mix</td>
<td>Roasted and ground rice, wheat, black gram, and sugar in ratio 1:1:1:2. Provides 380 kcal/100 g</td>
<td>Sree Avittom Thirunal Hospital</td>
<td></td>
<td>Kerala</td>
</tr>
<tr>
<td>Mix</td>
<td>-</td>
<td>National Institute of Nutrition, Hyderabad</td>
<td></td>
<td>Andhra Pradesh</td>
</tr>
<tr>
<td>High calorie cereal milk</td>
<td>-</td>
<td>Christian Medical College, Vellore</td>
<td></td>
<td>Tamil Nadu</td>
</tr>
<tr>
<td>Sattu maav</td>
<td>Wheat flour 42%, maize flour 10%, malted ragi flour 5%, Bengal gram flour 12%, jaggery 30%, vitamin premix 1%. 100 g provides 9-10% protein, and 360 kcal</td>
<td>Nutrition Monitoring Program</td>
<td></td>
<td>Tamil Nadu</td>
</tr>
</tbody>
</table>

Adapted from working group for children under 6 (2009)

Commercial enteral diets can be expensive, which is a potential problem for LMICs. In the partial unavailability of industrialized feeds, part industrialized feeds and part homemade nutrient dense foods can be used, so the commercial diet can last longer. However, when completely unavailable, the industrialized feeds can be replaced by homemade nutrient dense foods blanderized, such as soups, smoothies, and milk based drinks.[11] Table 2 exemplifies a homemade enteral diet menu used for patient education in Sao Paulo, Brazil. The quality of the homemade enteral diet should be based on regular healthy eating recommendations to the patient's age, food restrictions, social conditions, and food availability in the region/country. It is important to strain all foods before putting on the feeding tube to keep it from clogging. Food safety is an essential focus of patient education when using homemade feeds.

The administration of enteral feeds usually counts on a diet pump that controls infusion speed. However, whenever enteral feeding pumps are not available, the diet can be infused in boluses using a syringe, administered slowly. The maximum recommended speed is 20 mL/min, so that it takes at least 15 min to give a feed to the patient. If there is a need for even slower diet infusion, gravity feeding can be used by hanging the feeding bag at least 60 cm above the patient’s head and attaching the tip of the giving set tube to the feeding tube, allowing the feed to run in by gravity. If the feeding bag tubing has a clamp, it can be used to adjust the flow rate.[11]

In cases that present the need for use of partially hydrolyzed or aminoacid-based formulas and those are unavailable, a combination of middle chain triglycerides and maltodextrin can be used. An observational study from Brazil used pineapple to obtain meat/poultry hydrolysis, by blenderizing one part of pineapple juice in natura and one part of meat and leaving the mixture in water bath for 30 min.[12]

Parenteral Nutrition

There are several oncologic situations where oral/enteral nutrition is impossible or even dangerous and parenteral nutrition (PN) is indicated. PN is not meant for routine use during oncologic treatment since it represents increased risk of line infections, hyperglycemia, hypertriglyceridemia, and cholestasis.[6] Its indications are basically the same as the ones for ETF, except that for a medical reason the patient is unable to safely tolerate/absorb nutrients through the gastrointestinal tract. PN should only be used if the need for nutritional support is anticipated to be longer than...
5–7 days.\textsuperscript{[5,13,14]} The timing for introduction is a clinical decision and its advantages must be weighed against the risks of therapy.

The delivery of PN as well as the standard solutions and facilities for aseptic preparation are expensive. Furthermore, it requires planning as well as monitoring by trained professionals. In the absence of a standard PN solution, an aminoacid intravenous solution alone or combined with electrolytes and/or glucose can be used.

The planning of PN should consider the access, since peripheral PN can only be used for up to 2 weeks with a dextrose concentration of no more than 12.5%, while a central access allows longer duration of support and dextrose concentration of up to 20%.\textsuperscript{[11]} Monitoring for complications related to central venous access, glucose levels, electrolyte and mineral levels, hepatic or gallbladder effects, volume, and lipid emulsions is essential. Once the patient is stable, blood tests can be done less often. It is recommended that a nutritional assessment is done at least every 2 weeks.\textsuperscript{[13,15]}

Nutritional support for pediatric patients with cancer remains a challenge, especially in LMICs. Nonetheless, this challenge can and should be undertaken by getting the best out of the available resources.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References