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Polymeric Formula in the Nutritional Recovery of a Patient with Chronic Malnutrition and Multiple Comorbidities

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Introduction

Child malnutrition is one of the most serious public health issues at global level, and more so in developing countries, such as Peru[1].

Clinical Case

This case relates to a patient aged 5 years and 10 months who was admitted as an emergency to Guillermo Almenara Irigoyen National Hospital – ESSALUD (Lima, Peru) with fever associated with episodes of convulsions. The patient was diagnosed with anti-NMDA receptor encephalitis. His condition progressed rapidly, and the seizures were not under control. He was put on artificial ventilation, given multiple antiepileptic drugs and placed under sedoanalgesia. He remained in hospital for 22 months. During that time, he suffered from intercurrent infections and neurological deterioration. He was struggling to gain weight as a result of functional digestive disorders, which were preventing him from achieving an appropriate nutritional recovery. He was given hydrolysed formulas, peptide-based formulas, but without a good clinical or nutritional response. Following a gastrostomy, he started taking Vitafos® Junior polymeric formula, which improved his nutritional status and digestive tolerance. The patient was discharged with Vitafos® polymeric formula. He had good oral tolerance to the product, and his nutritional status improved and recovered.

Nutritional evolution and follow-up of the patient (Table 1)

The patient was admitted to hospital at 5 years and 10 months of age, with a weight of 18 kg (25th percentile), a height of 104 cm (below the 3rd percentile) and a body mass index (BMI) of 16.6 kg/m^2 (adequate weight). At his most nutritionally compromised state, when he was 7 years and 4 months old, the patient weighed 15 kg (below the 3rd percentile) and had a height of 114 cm (3rd percentile) and a BMI of 11.6 kg/m^2 (low weight). A gastrostomy was performed at that point, and he was fed through that method. In addition, he was started on Vitafos® polymeric formula, administered orally in minimal amounts. He presented good tolerance to the formula. He started to gain weight, and his muscle mass improved. Three months after starting on Vitafos® polymeric formula, the patient was discharged with a weight of 21 kg, a height of 115 cm and a BMI of 15.9 kg/m^2 (healthy weight).

Table 1. Anthropometric progress

Age	Weight	Height	BMI
5 years and 10 months	18 kg	104 cm	16.6 kg/m^2
7 years and 4 months	15 kg	114 cm	11.6 kg/m^2
7 years and 7 months	21 kg	115 cm	15.9 kg/m^2
8 years	25 kg	120 cm	17.3 kg/m^2

BMI: body mass index.

He continued gaining weight and managed to take Vitafos® polymeric formula orally at higher volumes without the gastrostomy feeding device. He now weighs 25 kg (50th percentile), is 120 cm tall (25th percentile) and has a BMI of 17.3 kg/m^2 (healthy weight). The patient is currently under multidisciplinary care, both clinically and nutritionally, provided through home visits and outpatient appointments.

Discussion

The term *enteral nutrition formula* includes any kind of dietary food for special medical purposes administered via the digestive system. Such formulas provide a variable amount of macro- and micronutrients aimed at covering a patient's nutritional requirements[2].

In cases of malnutrition linked to disease, there are several factors involved, such as fasting and the disease itself, as well as factors relating to healthcare professionals' lack of sensitivity and training when considering this problem in order to pay attention to its prevention and treatment[3]. Nutritional support therapy strategies must be designed specifically for each patient. In our patient, the nutritional improvement was clear from the moment he first started taking the hypercaloric polymeric formula Vitafos® Junior. Vitafos® Junior is a gluten-free and lactose-free hypercaloric, normoproteic polymeric formula of high nutritional value that helps cover a patient's energy and nutritional needs. In their study, Lama et al. found that the use of hypercaloric polymeric formulas with synbiotics and docosahexaenoic acid or DHA (Vitafos® Junior) had a positive nutritional impact and better tolerance in patients with failure to thrive[4]. In our patient's case, Vitafos® Junior hypercaloric polymeric formula led to an improvement in anthropometric values and better digestive tolerance, which are typical of nutritional recovery with Vitafos® hypercaloric polymeric formula.

Key Points

- Malnutrition is still a very prevalent problem in our paediatric population.
- Supplementation and support with a polymeric formula are key to nutritional recovery.

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The Role of Oral Supplements in Children with a Micronutrient Deficiency: a Case Study

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Introduction

One in every three children under 5 in the world is not growing properly due to malnutrition, as shown by delayed growth, emaciation and excess weight, and half of all children under 5 suffer from hidden hunger as a result of a micronutrient deficiency[1]. In Ecuador, the National Health and Nutrition Survey (ENSANUT 2018) found chronic malnutrition in 27 out of every 100 children under 2[2].

Clinical Case

On 13 October 2022, a female patient aged 14 months came into the surgery. Pathological family history: none. Prenatal history: the patient's mother suffered from anaemia when pregnant, and this was treated with iron. Neonatal history: as the child was born at home, no anthropometric data or APGAR score was available. Postnatal history: the patient was exclusively breastfed until her sixth month of life, when she was introduced to solids. She has not been taken in for paediatric check-ups. She started eating the same food as her family from around her first birthday. She has not completed the vaccination schedule. Reason for the consultation: the mother reported that, during the previous week, the child had been suffering from a high temperature, coughing, a runny nose, liquid and foul-smelling loose stools three times every 24 hours, anorexia and irritability. On physical examination, she looked pale and her skin and mucous membranes were dry. Rhonchi were detected on auscultation of the lung fields. The following anthropometric measurements were taken and interpreted in accordance with the World Health Organization's tables: weight = 8 kg (Z-score < 1.5); height = 78 cm (Z-score > 1); head circumference = 45 cm (Z-score < 1); weight/height (Z-score < 2); mid-upper arm circumference (MUAC) = 16.3 cm. Diagnosis: respiratory infection, acute malnutrition and mild dehydration. Laboratory tests were ordered, and a diet of binding foods, oral hydration and antipyretics was prescribed.

The results of the tests arrived on 15 October 2022. Below are the results of interest to the case at hand: red blood cells = 3820000/µL; haemoglobin = 11 g/dL; haematocrit = 32.60%; white blood cells = 15130/µL; segmented neutrophils = 40.90%; eosinophils = 0.70%; basophils = 0.30%; monocytes = 7.50%;

lymphocytes = 50.10%; mean platelet volume = 8.60 fL; platelets = 614000/µL; peripheral blood smear: normal red and white blood cell count; ferritin = 64.99 ng/mL; C-reactive protein = 27.18 mg/L; total serum iron = 22.96 µg/dL; serum transferrin = 162.47 mg/dL; transferrin saturation = 11.00%; transferrin index = 0.20; zinc: 60 µg/dL; stool analysis: normal; stool culture: negative.

The initial diagnoses were confirmed, and a diagnosis of iron deficiency anaemia was added. The United States Food and Nutrition Commission's recommendation for children of 1 year of age is 100 kcal/kg per day and 1.5 g/kg of protein per day. The recommendation is to continue breastfeeding and feed the child a soft diet of binding foods. Medical prescription: antibiotic, antipyretic and oral hydration. Due to the patient's higher energy and nutrient requirement as a result of the infection and malnutrition, she was prescribed a nutritionally complete formula with 1.31 kcal/mL, 6.1 g of whey protein, 3.1 mg of iron (25.8% of the recommended intake for her age), which provides 260 kcal per serving and contains prebiotics and probiotics, medium chain triglycerides, essential fatty acids and micronutrients such as zinc, vitamin A and iodine, which are particularly relevant in cases of hidden hunger. The first check was carried out on 2 August 2022. The child's mother reported that her appetite had improved. The patient was asymptomatic, and her weight had increased by 10%. She was further prescribed 50 mg/day of iron polymaltose. The second check, carried out on 15 August 2022, found the following values: serum iron = 71.54 µg/dL (50-120); zinc: 84.41 µg/dL (31-120). The third check, carried out on 29 August 2022, found that the patient had gained weight and her MUAC and head circumference measurements had increased (Figure 1).

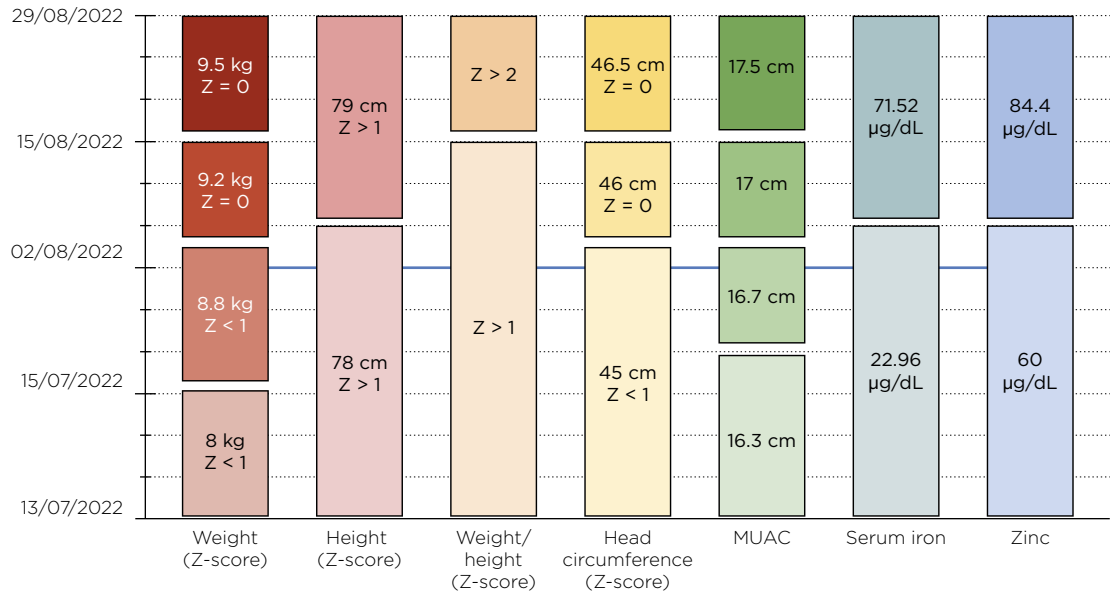

Figure 1. Anthropometric measurements and iron and zinc levels measured before and after oral supplementation.
MUAC: mid-upper arm circumference.[1]

Discussion

Hidden hunger affects 2 billion people worldwide, particularly young children and women of childbearing age. The most frequent deficiencies are iron, vitamin A, zinc and iodine, which can coexist with other forms of malnutrition[3]. In the clinical case at hand, the patient's diet is nutrient-deficient. She has a weight/height ratio with a Z-score of < 2, which is consistent with acute malnutrition, aggravated by another form of malnutrition: iron deficiency (hidden hunger). A polymeric formula with milk protein was chosen to treat the nutritional deficiency. Studies such as the one carried out by Stobaugh et al., a randomized, double-blind clinical efficacy trial on children aged 6 to 59 months with moderate acute malnutrition in rural settings of Malawi and Mozambique, have highlighted the importance of milk protein in the treatment of this condition[4]. Furthermore, as to the role of the quality of a person's diet, their intake of fermentable carbohydrates known as FODMAP (fermentable oligosaccharides, disaccharides, monosaccharides and polyols) and prebiotic fibre must be considered in connection with maintaining a healthy gut microbiome, as microbiome alterations and the resulting dysbiosis have been linked to later development of obesity, diabetes, irritable bowel syndrome, inflammatory bowel disease, depression and cardiovascular disease, as well as to a strong impact on countries' economic and social development[5].

Conclusion

Diagnosing and treating every form of malnutrition protects all aspects of the future of humankind.

Key Points

- Malnutrition can appear in all three forms in a single family.
- Hidden hunger can be present in cases of both nutritional deficit and excess.

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Link Between Micronutrient Deficiency, Malnutrition and Recurrent Illness

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Introduction

Malnutrition, a term designated for nutritional deficits, can lead an individual to develop either overnutrition or undernutrition. Undernutrition comprises multiple conditions, including acute, chronic and micronutrient deficiencies. Chronic undernutrition (CUN) is caused by inadequate intake of the essential macronutrients needed by the body for development for a prolonged period. The most common indicator for CUN is stunting: short stature for the patient's age[1]. On the other hand, acute undernutrition (AMN) is caused by a notable reduction of food intake or by poor-quality diets, and it is often linked to pathological causes. AMN is usually referred to as wasting and is defined using anthropometric cut-off values and clinical signs, usually the mid-upper arm circumference and weight-height Z-score[2].

Micronutrients are essential dietary elements that are necessary for an individual in varying quantities to coordinate various physiological functions that maintain health. Deficiencies in certain micronutrients such as iron, vitamin A, zinc and iodine are linked to effects on an individual's physical activity, learning ability and even immunity.

Therefore, our role as health professionals is to integrate and enhance health and nutrition, prevent and manage undernutrition, and provide adequate education and supplementation such as Vitafos® for families and caregivers.

Clinical Case

The patient was a 5-year-old girl with poor growth, physical weakness and pallor. Her parents stated that she suffered from recurrent illnesses and poor appetite, accompanied by low physical activity. There was no family history of any similar conditions.

An anthropometric assessment was performed on the patient, revealing that she was underweight for her age, weighing 14 kgs and standing at 104 cm in height. This placed her in the 3rd percentile of the CDC growth chart (females, aged 2-20). Due to the physical symptoms mentioned above, a laboratory assessment was performed, and the results revealed that she had low haemoglobin levels

(10 mg/dL), low s-iron (20 ug/dL), and low s-ferritin levels (25 ng/mL). No immunoglobin blood test was performed.

The patient was recommended to attend several follow-up visits to observe her condition.

Taking into consideration the above-mentioned factors, the patient showed signs of malnutrition and a slight iron deficiency, which could be treated by providing the appropriate amount of calories, vitamins, minerals and micronutrients she needed. A suitable supplementary source that can promote a patient's nutritional needs is (Vitafos®/Blenuten®), which provides 260 kcal/serving and contains a wide variety of minerals and vitamins that can promote physical and immune functions, as well as Omega 3 and Omega 6, which improve hormone and cognitive health.

Three months after the last follow-up, an anthropometric assessment was performed to examine the patient's condition. This revealed that her weight had increased from 14 kg (in the first visit) to 18 kg (Figure 1), and her height had increased to 105 cm. Following these results, a laboratory test was recommended to see whether there had been any changes since the previous test. The new lab test results showed an increase in haemoglobin, serum iron and serum ferritin levels (12.5 mg/dL, 50 ug/dL and 30 ug/dL respectively).

Discussion

As seen from the above result, Vitafos® has proven its potential for treating malnutrition across various age groups, especially developing age groups, by providing high amounts of micro- and macronutrients. Vitafos® contains a high nutritional formula that meets children's energy and nutritional needs. It is a rich source of vitamins, proteins, Omega 3 and 6, probiotics, and other essential minerals. It is beneficial not only for growth and development but also for boosting immunity. In our case, for instance, the patient was underweight and suffering from frequent sickness. The laboratory tests showed that she had weak immunity. After using Vitafos® for 9 weeks, the patient's weight increased significantly. To further assess

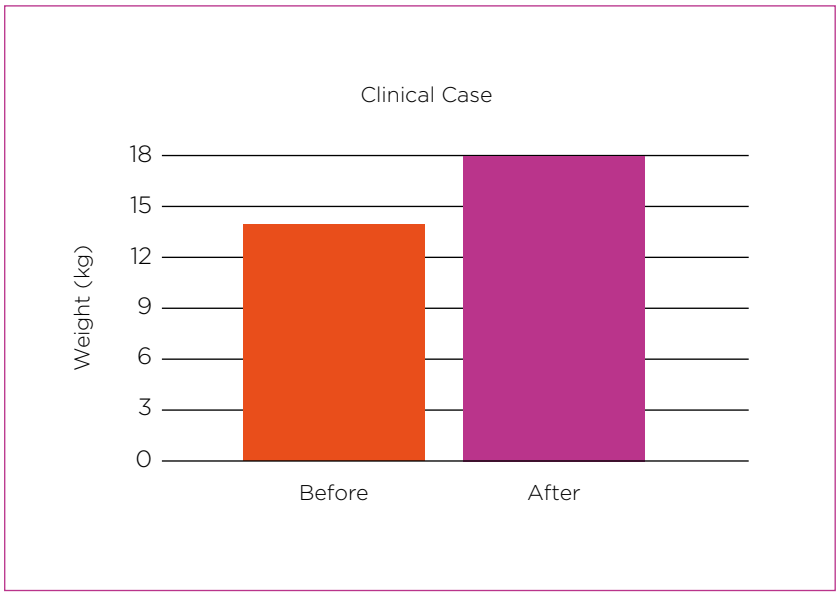

Figure 1. Vitafos® was recommended for the child, and weekly follow-up visits until 12 weeks were suggested. At the 12th week assessment, her weight was found to have increased to 18 kg, with less frequent illnesses and fatigue.

the patient's condition, another laboratory test was performed. The results showed an increase in immunoglobulin levels compared to the previous test. Moreover, serum iron and ferritin levels had also increased to normal levels. The patient's parents stated that "the child did not have any difficulty using Vitafos® formula and did not find it unpleasant".

Key Points

- **Micronutrient deficiency:** endemic vitamin A and zinc deficiency affects immunity, which leads to recurrent illnesses.
- **Iron deficiency / anaemia:** affects productivity and learning.
- **Eating disorders:** disproportionate nutrient intake can lead to chronic disease/ recurrent illnesses.

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Perioperative Nutrition of Children with Malnutrition, and Emphasis on 1.3 kcal/mL at Harapan Kita Hospital: A Case Report

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Introduction

Faltering growth is often seen in children with chronic diseases, such as biliary system disturbances, a congenital anomaly that requires several surgical approaches. Malnutrition is a common complication in these patients, as well as a well-recognised tremendous challenge for clinicians. Choledochal cysts are often diagnosed before the age of 10 years and are more common in females. Common symptoms include recurrent abdominal pain, jaundice and abdominal masses. Due to chronic biliary stagnation and recurrent inflammation, patients with choledochal cysts experience the formation of biliary sludge, which then leads to cholelithiasis. The gallstones may fall into the common bile duct and cause biliary colic. If the patient presents with these symptoms, an abdominal ultrasound can be used as a preliminary examination. This report relates to a paediatric case of malnutrition with a choledochal cyst presented as acute biliary colic pain.

Clinical Case

A thirteen-month-old girl with faltering growth became malnourished. She experienced flatulence and diarrhoea, sudden acute epigastric colic and stinging pain shortly after a meal. She needed to bend down at the waist and knee to relieve the pain, and she could hardly walk. She had nausea, vomiting and fever. She was initially diagnosed by another clinic as suffering from gastrospasms. Her stomach suddenly bulged. She was treated for 3 days, and the plan was to refer her to our hospital for surgery. She was finally sent to our emergency department and admitted for further evaluation and treatment. She had the following anthropometric examination results: weight: 7.6 kg; height: 78 cm; mid upper arm circumference: 10 cm under <-3 of standard deviation (SD); weight for height: under -3th of SD. A physical examination showed apparent tenderness and knocking pain over the right upper quadrant of the abdomen. There was neither rebounding pain nor jaundice. An abdominal X-ray revealed no specific findings. An abdominal ultrasound showed ascites and a cystic mass of 5.1 x 3.5 x 2.7 cm consisting of a choledochal cyst with congenital bile duct dilatation (Figure 1). The whole abdominal magnetic resonance imaging showed proximal right and left intrahepatic biliary duct dilatation. Extrahepatic biliary cystic dilatation from the choledocal cyst, as well as massive ascites and pleural effusion (Figure 2), were also found.

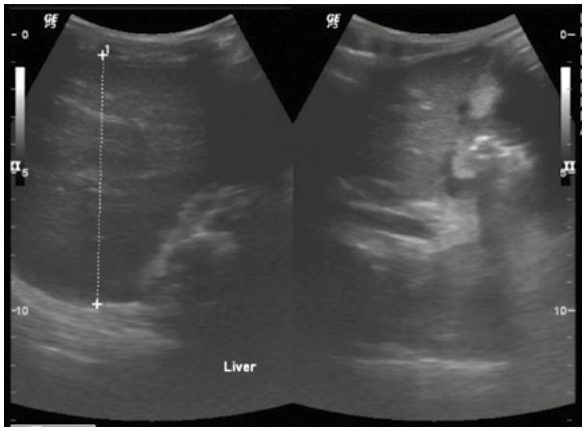

Figure 1. The abdominal ultrasound showed ascites and a cystic mass of 5.1 x 3.5 x 2.7 cm, consisting of a choledochal cyst with congenital bile duct dilatation.

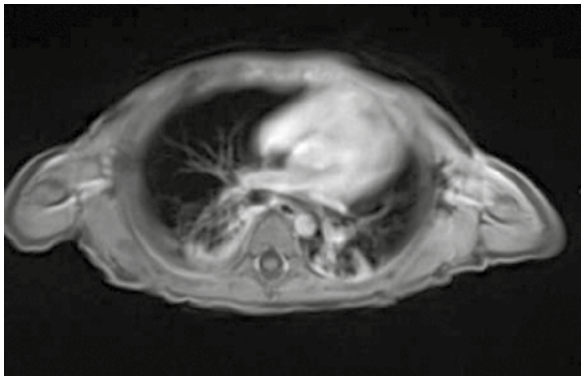

Figure 2. The whole abdominal magnetic resonance imaging revealed proximal right and left intrahepatic biliary duct dilatation, as well as extrahepatic biliary cystic dilatation from the choledocal cyst and massive ascites and pleural effusion.

The laboratory findings on admission showed anaemia, leucocytosis, thrombocytosis, hypoproteinaemia and hypoalbuminaemia, as well as increased alkaline phosphatase levels. General improvement was achieved by means of fluid therapy, a blood transfusion, and the administration of albumin and antibiotics. The patient was diagnosed with a choledochal cyst, ascites and pleural effusion, and severe malnutrition with anaemia, hypoproteinaemia and hypoalbuminaemia and infection.

The patient was put on enteral feeding through a nasogastric tube (NGT) alongside parenteral nutrition. Foods for special medical purposes (FSMP) providing 1.3 kcal/mL were gradually administered until 8x 60-90-120 mL/portion was reached. After reaching 70% enteral nutrition, parenteral nutrition stopped, and the patient was then started on full oral and enteral feeding. On the 3rd day of treatment, the infection, anaemia and hypoalbuminaemia and hypoproteinaemia resolved. Her weight increased by 200 grams on the 6th day. Her condition was stable and good and continued to progress. Finally, the intravenous line stopped and oral therapy and enteral feeding with FSMP providing 1.3 kcal/mL and regular oral meals continued. She was discharged on the 7th day of treatment. Further improvement continued at the paediatric surgery polyclinic and the paediatric nutrition and metabolic disease polyclinic, and the patient was prepared for a definitive surgical procedure. On her first check at our policlinic department on the 14th day, she was found to be healthy. Her weight was better, having risen by 8.3 kg, and the mid-upper arm circumference was 11.5 cm. The 1.3 kcal/mL FSMP diet was gradually increased 5 times by 150 mL which, added to 3 regular meals a day, resulted in a total caloric intake of 1200 kcal per day. She will be checked again in a month at our paediatric polyclinic to check for further nutritional improvement until she achieves a good nutritional status and to prepare for the next step or definitive treatment or surgery.

Discussion

In this case, the patient needed a diagnosis and pre-operative nutritional support to prepare her for definitive surgical management. The patient was a thirteen-month-old girl with recurrent abdominal pain, vomiting and fever that also suffered from feeding difficulties, faltering growth and severe malnutrition. Nutritional status is probably one of the most

thoroughly studied and well-known determinants of surgical outcomes. Between 40% and 50% of patients undergoing surgery have some degree of malnutrition.[1,2] Pre-operative malnutrition is associated with a higher rate of infection, worse evolution and healing of the surgical wound, development of pressure ulcers, and prolonged hospital stays, both in the intensive care unit and in the general wards.[3] Malnutrition is exacerbated by weight loss during hospitalisation, which occurs in up to two thirds of patients.[4,5] The patient was diagnosed as having a choledochal cyst, with ascites and pleural effusion, and severe malnutrition with anaemia, hypoproteinaemia and hypoalbuminaemia and infection. We applied symptomatic treatment, including stabilising her fluid balance and giving her antibiotics for a secondary infection, a blood transfusion for anaemia, and albumin for the hypoalbuminaemia. She was then given nutritional therapy in the form of oral nutrition supplements once she was stable. We gradually used a high-density 1.3 kcal/mL formula, starting with 10 mL/kg weight/portion, in small, frequent feeds through a NGT. Finally, the patient improved her condition, the infection was cured, and her weight increased from 7.6 kg to 7.8 kg. She was then sent home to continue catching up on growth, and her feeding was monitored through scheduled polyclinic appointments. On her first check at our polyclinic department, her weight was 8.3 kg (the ideal weight goal is 10 kg). Definitive surgery for the choledocal cyst will be scheduled once she has achieved a better nutritional status.

The patient suffered from severe malnutrition. A comprehensive approach to nutrition in this paediatric surgical patient was important and included a pre-operative assessment, perioperative nutrition considerations and post-operative recovery.[6] High caloric density formulas can be used to safely increase nutrient intake and promote weight gain in children. This nutritional formulation could potentially prevent malnutrition and failure to thrive in paediatric patients.[7]

Pre-operative malnutrition is associated with increased complications and mean number of days in hospital following surgery. Enteral and parenteral nutrition can be used to maintain and possibly improve nutrition status in cases where food intake is inadequate, especially in the 7-10 days prior to surgery. In the perioperative period, fasting should be limited to restricting solid foods and non-human milk 6 hours prior to the procedure and allowing clear liquids until 2 hours prior to the procedure. If nutrients cannot be provided orally, enteral or parenteral nutrition should be initiated within 24-48 hours of surgery.[8]

Conclusions

Perioperative nutritional support, has proven to be a main element and a critical step to achieve better surgical results. Starting with the pre-operative nutritional assessment and treatment in elective surgery, we can improve nutritional status by using oral supplement formulas. By adding early nutritional support in the pre-operative scenario, we can significantly reduce infection-related complications, a key issue in intensive care units and hospital stays and to reduce mortality and costs.

Key Points

- A good nutritional status before surgery is directly related to a shorter recovery time.
- Oral nutritional supplementation has a positive impact in the pre-operative period in patients who are at nutritional risk.

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Benefit of Polymeric Formula for Patients with Feeding Problems and Unbalanced Diets in Cases of Children Who are Bad Eaters

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Introduction

One of the most frequent reasons why children are taken to the paediatrician in Spain is that "my child won't eat". Bad eaters are defined as children who are unable to eat or refuse food due to a lack of appetite, or who are very selective with the foods they are willing to eat, resulting in unsuitable habits. This may be caused by food learning problems, behavioural problems or underlying diseases and is one of the main concerns of parents[1,2].

Over 10-25% of parents of healthy children under 3 are also concerned about feeding disorders, but only 1-5% of babies and young children suffer from severe feeding problems leading to delayed growth in Spain[2,3].

These are most common between 18 and 24 months of age and start becoming less frequent from the age of 3 or 4 onwards. This issue has a prevalence of 10-50%[1].

Case Study

A 13-month-old male infant with a personal history of birth at full term, appropriate for the gestational age, and with a good weight at birth. He was exclusively breastfed until he was 6 months old and was introduced to solids without any incidents (a balanced diet composed mainly of animal protein, fruit, vegetables and pulses).

Soon after turning one, the child started to show selective feeding behaviour, leading his mother to take him to the doctor on the basis that he was not feeding well and was not properly nourished.

The physical examination found a weight curve in the P3-P10 percentile and a height in the P10-P25 percentile, with no physical abnormalities. The child would refuse food at feeding times, leading the mother to worry that he was not eating enough at each meal and, therefore, to offer him mainly his preferred foods. Laboratory tests were ordered to rule out any organic causes, and the results were normal.

In view of the child's normal clinical history, physical examination and laboratory tests and the fact that he had been diagnosed as a bad eater, a Vitafos®/Blenuten® nutritional supplement designed to help cover the child's energy and nutrient needs was prescribed. The child was to be given a daily glass (200 mL) of this, to be taken in the middle of the

afternoon, as an afternoon snack, without replacing any of his main meals. A clinical check-up was carried out one month later. This revealed an improvement in the child's weight percentile, as his weight had risen from 8100 g to 8995 g, placing him in the P10-P25 weight percentile (Figure 1), as well as improvements to both his appetite and the intake of previously refused foods. Another check-up was carried out at 15 months. This showed an increase in the child's weight curve, and it was decided to continue with the nutritional supplement in view of the improvement seen in the patient's weight and appetite.

Discussion

Following the introduction of solids, an infant needs to achieve certain sensory-motor skills and milestones in order to adapt to the new foods and feeding methods. Exposure and habit-forming also facilitate and channel the development of these skills[4].

Establishing good habits during the first two years of life is perhaps the most effective way to forge an appropriate feeding behaviour in order to establish food intake patterns, habits and preferences[4]. Paediatric nutritional supplements (Vitafos®/Blenuten®), available in a range of both flavoured and unflavoured products with no added sugars, help supplement a child's diet by providing additional energy and nutrients. These can be added to prepared food, which can prove particularly useful in cases of difficulty introducing new foods, with optimum results on children's growth and improved nutritional profile.

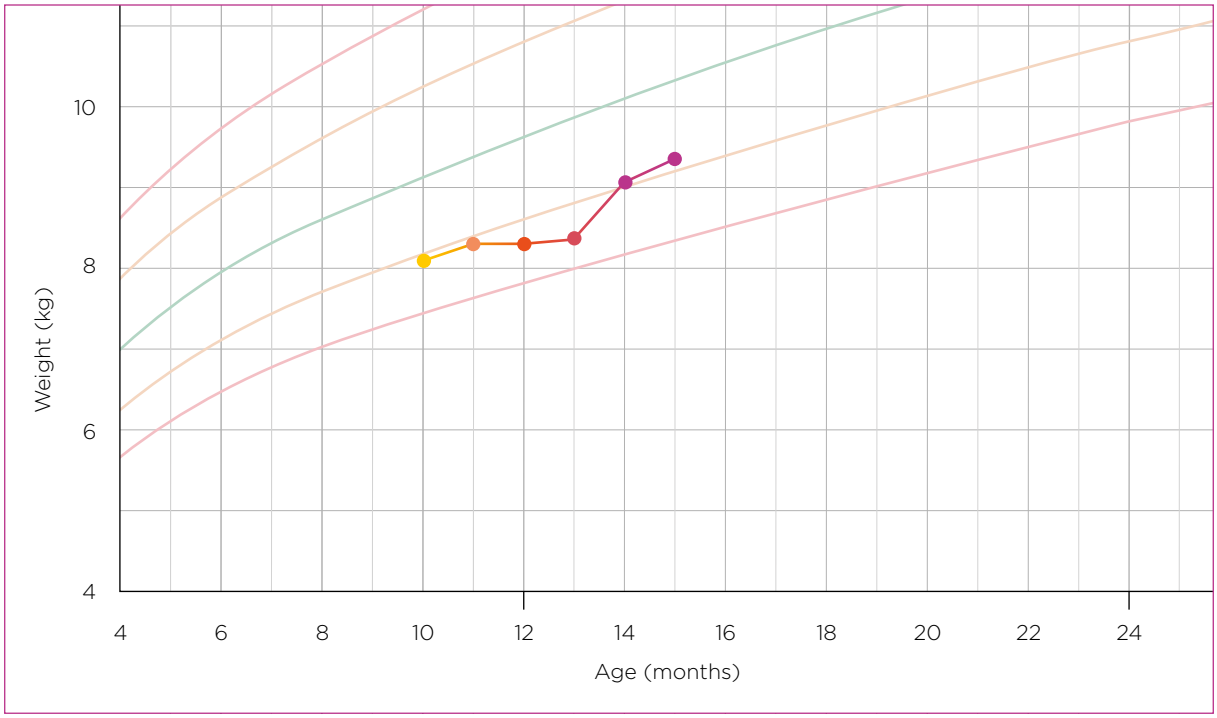

Figure 1. Patient's growth curves (weight).

Key Points

- A child is a bad eater when they exhibit an inability or refusal to eat.
- Appropriate behaviour leads to food intake patterns and preferences.
- Nutritional supplements provide suitable nutritional support when added to a child's diet.

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