

The importance of proper use of oral nutritional supplements in oncological patients undergoing surgery

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ABSTRACT:

Introduction: There are many natural approaches that may improve the nutritional status in malnourished patients. Increased consumption of natural food is a more physiological, attractive, and available form of nutritional therapy of patients than medical nutrition. However, in specific clinical situations, oral nutritional supplements (ONS) may constitute a good support of nutritional management in malnourished cancer patients. Selecting proper ONS and their appropriate use may reduce the risk and progression of malnutrition and significantly affect oncological patient's treatment as well as decrease the rate of postoperative complications. Oral nutritional supplements should be the first nutritional choice to prevent and correct nutritional disorders in oncological surgery patients, especially during the pandemic, with the connected inability to visit patients. Despite this, many specialists recommend improperly adjusted preparations, and they do not consider all ailments and diseases of the patient. If ONS are overused or used inappropriately, they can cause many clinical disorders.

Aim: This paper aimed to help explain and understand the general recommendations on the proper administration of ONS, their benefits, and difficulties connected with their use in clinical practice.

KEYWORDS:

cancer, clinical nutrition, malnutrition, oral nutritional supplements

ABBREVIATIONS

ALA – alpha-linolenic acid
BAPEN – British Association for Parenteral and Enteral Nutrition
BMI – Body Mass Index
COVID-19 – coronavirus disease 2019
DHA – docosahexaenoic acid
DM – diabetes mellitus
EPA – eicosapentaenoic acid
ESPEN – European Society of Clinical Nutrition and Metabolism
FFMI – fat free mass index
FOS – fructo-oligosaccharides
GI – gastrointestinal
GIP – gastric inhibitory polypeptide
GOS – galacto-oligosaccharides
MUFA – monounsaturated fatty acids
NCPM – nutrition care process model
NICE – National Institute for Health and Care Excellence
ONS – oral nutritional supplements
PC – pancreatic cancer
PD – pancreaticoduodenectomy
PUFA – polyunsaturated fatty acid
SCFAs – short-chain fatty acids

INTRODUCTION

Malnutrition is common in gastrointestinal, neurological and oncological patients in the elderly population. Nutrition therapy includes enteral and parenteral nutrition, as well as oral delivery of nutrients. One of the best preoperative methods to prevent postoperative complications is to improve the parameters of patient's nutritional

status before surgery. For this purpose, the use of oral nutritional supplements (ONS) is recommended. Special diet, regular fortified nutrition and ONS are an important support for multidisciplinary therapy of oncological and surgical patients [1].

Oral nutritional supplements play an important role in malnutrition prevention and improve nutritional status parameters, as well as are linked with many clinical benefits. ONS improve clinical parameters in gastrointestinal disorders, neurological dysfunction and cancer patients [2, 3]. In cancer patients they may reduce weight loss, stimulate appetite and proteosynthesis, decrease fat-free mass losing and increase the quality of life [4]. Based on the European Society of Clinical Nutrition and Metabolism (ESPEN) guidelines, ONS should be the first nutritional choice to prevent and correct nutritional disorders in oncological surgery patients [5].

Cancer-related malnutrition is a common phenomenon in oncological patients which occurs in 30–90% of the patients and depends on tumour size and its location, stage, treatment-related complaints and covering the nutrients demand. Thus, it is important to detect symptoms of malnutrition as early as possible and implement appropriate nutritional support.

Malnutrition is defined by ESPEN as [5]:

1. BMI <18.5 kg/m², BMI <22 kg/m² in patients over 70 years old;
2. unintentional weight loss of more than 10% or more than 5% over the last months with reduced BMI;
3. or low FFMI (fat free mass index) in terms of gender.

Since malnutrition increases the percentage of perioperative complications, it is important to detect nutritional status disorders before the onset of cancer therapy. The following data questionnaires may be used for assessing the risk of malnutrition [6]; NRS 2002, Nutritional

Risk Score, MUST or SGA during the first examination on admission as well as information about lower food intake and unintentional weight loss before hospital admission, low albumin level <3 g/dL.

Nevertheless, there are no clear and proven recommendations for the use of ONS in malnourished patients and those being at high risk of malnutrition. Such recommendations would be really helpful for the ill, especially in the pandemic – where the access to nutritional experts has been limited.

DEFINITION, COMPOSITION, AND TYPES OF ONS

The fundamental problem is the lack of appropriate consensus on terminology in global regulation of the ONS category as food products, dietary supplements or natural health products [7]. Based on the European Union Directive, ONS are a special category of medical food for the nutritional support of malnourished patients or those at risk of malnutrition and used under medical supervision [8].

ONS are recognized as an integral part of treatment and prevention strategies for disease-related malnutrition and inpatient malnutrition [9]. Furthermore, ONS are sterile liquids, nutritional bars or powders and are available to buy over the counter also in pharmacies and internet sales and taken orally as a nutritional support [10].

ESPEN recognizes the ONS as nutritional products for medical nutrition therapy. The composition of ONS is based on natural ingredients; protein from cow milk or soybeans, peas, gelatin, fatty acids from vegetable oils (sunflower, high-oleic sunflower, soybean oil, rapeseed, and carbohydrates from wheat starch, corn starch and cane sugar [11].

They are available in a variety of flavours and usually used to supplement insufficient nutrition with natural diets. ONS should only be recommended under the supervision of appropriately trained medical personnel. An interdisciplinary medical team should be responsible for determination of the appropriate ONS for an individual patient.

ONS can be classified into many categories according to their nutrient profiles and indications:

1. They can be considered as nutritionally complete, including essential amino acids, fatty acids and other nutrients and be used as the only source of nutrition and as nutritionally incomplete. If ONS supply is insufficient to meet daily nutritional needs of macro- and micronutrients, they can be an additive to the diet, and they should not be used as a sole source of nutrition [6];
2. There are also classifications due to the degree of hydrolysis of macronutrients:
 - Polymeric – whole molecules (well tolerated by most of the patients),
 - Oligomeric – partially hydrolysed ingredients (difficulty digesting and absorbing),
 - Monomeric – elementary, highly hydrolysed molecules; tasteless for the sick, with a bad smell. For the use in metabolic diseases.
3. Calorific value; hypercaloric 1.3–2.4 kcal/mL, isocaloric around 1 kcal/mL, hypocaloric <1 kcal/mL;
4. Or selected nutrient, e.g., high-protein, high-energy, high-fiber, low-fat.

ONS are adapted to the various metabolic demands and medical conditions of the patients (e.g. diabetes, cancer, renal failure, cirrhosis, pressure ulcers). Not all products are appropriate to all cases of a disease. Products dedicated to the same category of diseases may have a thoroughly different composition. They may contain lactose and gluten or be lactose- and gluten-free; therefore, it is important to check the composition before recommending them.

Immunonutrition constitutes a special category of ONS. It contains immunoactive additives such as eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA), alpha-linolenic acid (ALA), arginine, glutamine, zinc, selenium, nucleotides, and vitamin E which help to reduce the parameters of inflammation and may reduce the effects of oxidative stress.

Additionally, they are available in various versions: nutritional bars (e.g. high-protein, fortified in vitamins with minerals of various flavours, high-fiber or without fiber), powder (e.g. including normo-energy, high-protein, sugar-free).

APPLICATION IN CLINICAL PRACTICE

ONS are convenient, easy to use and well-balanced and may be used as additives to the daily diet or basal nutrition during nutritional therapy and components of meals. The National Institute for Health and Care Excellence (NICE) clinical guidelines CG32 also include recommendations for the use of oral nutritional support in catabolism, with increased nutritional needs [12]. ONS should only be recommended under the supervision of appropriately trained medical personnel. An interdisciplinary medical team should be responsible for determination of the appropriate ONS for an individual patient. ESPEN recommendations also include present or impending malnutrition, period preceding major abdominal oncological surgery (e.g. pancreatoduodenectomy, gastrectomy) or surgery of the head and neck area – routine 5–7-day pre-operative nutritional support [5, 6].

Below there are selected guidelines referring to prescribing ONS based on NHS 2020 (Nottinghamshire Area Prescribing Committee) [13]:

- eating orally first – healthcare professionals should encourage patients to fortify foods and eat high-energy food;
- ONS should be taken when patients can eat orally, but it is an insufficient way to provide enough micro- and macronutrients;
- MUST tool should be used to prescribe ONS to patients with a high risk of malnutrition;
- after being discharged from hospital patients should continue ONS supplementation only when their GP recommends this kind of nutritional support;
- ONS should be drunk between or after meals. ONS intake should not be recommended before meals or as daily meals;
- preferred amount of ONS prescribed is 2 bottles;
- mono-component diets should be used under medical supervision.

Formulations are versatile and may be recommended in:

- short bowel syndrome,
- dysphagia,

- intractable malabsorption,
- pre-operative preparation of undernourished patients,
- inflammatory bowel disease,
- total gastrectomy,
- bowel fistulae,
- disease-related malnutrition (chronic/acute).

It is usually recommended having 200–600 kcal intake per day as nutrition support, and it is worth remembering that ONS may be the only source of food only periodically [14]. However, the British Association for Parenteral and Enteral Nutrition (BAPEN) does not recommend ONS without monitoring their proper intake [15].

The oral supply of ONS is a physiological route. Therefore, taking ONS has significant advantages compared to parenteral or tube feeding nutrition and is more preferred by patients. It is especially important to select the preparation individually according to the patient's needs and possibilities. The longer fasting and malnutrition period was, the lower energy value should be given and lower-density ONS should be a prime choice for severely malnourished patients. Based on the meta-analysis of older people with anorexia, taking ONS had a positive effect on overall appetite, but this effect was not observed in case of the intake of high-density formulations. Taking ONS can be effective in weight gain, overall energy intake and decrease in pressure sores. The research concludes that more studies are needed for assessment of the significance of impacts of ONS on the mentioned parameters [16]. No significant differences in malnourished inpatients were observed between consuming a high-frequency and lower-volume vs less-frequency and higher-volume ONS (four times per day with 62 mL and 125 mL twice per day between meals). However, an increased intake of supplement in higher frequency group (84 kcal) ($P < 0.001$) was noticed [17]. Nevertheless, in some patients a small portion with greater frequency will be better tolerated (e.g., after gastrectomy).

APPLIED ACCORDING TO THE SELECTED CASES

Head and neck tumours

Tumours located in the head, neck, and oesophagus are strongly associated with the occurrence of malnutrition. Most of the patients had significant weight loss at diagnosis. Moreover, patients with head and neck tumours are commonly affected by such ailments as dysphagia, problems with biting and chewing food, xerostomia, odynophagia, mucositis, nausea, vomiting, changes in taste and smell. All the ailments contribute to inability to intake food and malnutrition and cachexia. Some symptoms persist for weeks or even months after the end of chemo(radio)therapy. Consuming solid foods by the oral route is then almost impossible. In this case, an appropriate nutritional strategy is essential and may determine the effectiveness of oncological treatment. Whenever possible, ONS should contain a significant amount of protein, energy and immunonutrients (particularly omega-3) and be applied as soon as possible regardless of the degree of weight loss [18]. In many cases, a high-fat diet will be recommended, especially in advanced cancer. Considering European guidelines, immunonutrition in head and neck cancer patients should be recommended 7–14 days before the surgery treatment and 10–14 days after operation in the cases of malnutrition and inflammation [19, 20]. Hypercaloric preparation taken in small amounts throughout the day led to decreased muscle mass

loss and increased dietary protein intake in patients with locally advanced nasopharyngeal cancer in due course of chemotherapy [21]. Due to changes in taste sensation, patient's individual preferences should be taken into consideration. Occasionally, it may be helpful to use infant formula, cool ONS or add powder formulas (high protein) to the meal.

Pancreaticoduodenectomy

Commercially available supplements for nutritional support in pancreatic cancer (PC) patients have a different composition and caloric value (1–2 kcal/1 ml). Many recommendations for PC include reducing the amount of fatty acids in diet. Fat reduction in ONS and diet should not be recommended routinely for all pancreatic diseases, and may be used in patients with serious dysfunction of exocrine pancreas function and steatorrhea. Fatty acids supply more energy than protein or carbs and decrease the risk of fluctuations in blood glucose levels. Fats in diet determine the organoleptic improvement and may stimulate appetite. So far, in patients after pancreaticoduodenectomy (PD), a low-fat diet has been recommended. More recent studies indicate that fats, in adequate amounts, are well tolerated by patients after PD and overall increase their energy. Such a nutritional intervention may improve the nutritional status after PC surgery [22]. Patients after pancreatic surgery may have glycaemic disturbances, therefore limiting sugars and adding dietary fiber soluble in ONS may be recommended. In many PC patients, the preparation without food fiber is often mistakenly recommended. Soluble fiber fractions do not irritate the gastrointestinal tract as the insoluble fractions, and can effectively reduce glycemia after meal. Currently, available ONS dedicated by their producers to patients with pancreatic disorders usually contain a lot of sugar, are fat-free and have no dietary fiber.

In studies describing the application of normal formula and the one with slow-digesting carbohydrates used in diabetes mellitus patients, the results showed better metabolic profile when participants were taking ONS with special formula. Isomaltose and sucromalt, intestinal amylase-resistant dextrin may be a beneficial supplement for DM patients similarly to monounsaturated fatty acids' addition. The mentioned additives to ONS may reduce GIP levels and subsequently decrease insulin secretion and better regulate postprandial appetite (plasma glucose levels are significantly lower after ONS-DM intake than normal formula) [23–25]. Patients on high MUFA diet had better glycaemic control and improved insulin sensitivity [26]. Our clinical practice shows that this kind of ONS often cause hyperglycaemia and patients feel unwell after their consumption. Therefore, while choosing the appropriate type of ONS, the composition of the product should be considered more than the intended use declared by its manufacturer.

Gastrectomy

Patients undergoing surgical treatment of gastric cancer receive oral nutrition a few days after operation. Due to the performed gastrectomy they relatively often complain of dysphagia, early satiety, dumping syndrome, diarrhoea and glycaemic disorders. They usually develop malnutrition within a few weeks after the surgery [27]. Taking ONS in the postoperative period may improve the nutritional status parameters, reduce anorexia and decrease the incidence of sarcopenia [28]. However, some studies indicate that early (within 48 hours) oral nutrition is well tolerated by patients and does not

cause any gastrointestinal problems [29, 30]. Recommending oral nutritional supplement can be helpful both in expanding diet after surgery and meeting the demand of the patient in the long-term nutrition. It may be advantageous to use high-protein preparations (they are not always well tolerated – better protein powder tolerance is observed), enriched with n-3 fatty acids and with limited sugar content and added soluble fiber. Additionally, some patients do not tolerate lactose-containing preparations. In patients after gastrectomy, drinking ONS in small portions throughout the day will be the more favourable option. Patients with reduced upper gastrointestinal volume after gastrectomy do not tolerate large amounts of the nutrient in one meal. Hence, it will be much more beneficial to drink it in small sips or to feed it with a spoon.

Perioperative period

For surgical patients, a clear carbohydrate drink before and 2 hours after surgery may be recommended to reduce postoperative insulin resistance and decrease perioperative anxiety [6].

ONS taken during perioperative time improve nutritional status and may be a helpful solution to feeding initiation after surgery. In patients who underwent gastrointestinal surgery, using ONS may significantly reduce the postoperative complication rate and decrease weight loss [31]. The nutrition care process model (NCPM) is one of the novel solutions of care for surgical patients and consists of: nutrition assessment, nutrition diagnosis, nutrition intervention and nutrition monitoring and evaluation [32]. Furthermore, ONS were associated with a shorter length of hospital stay after pancreaticoduodenectomy compared to enteral tube feeding [33].

Immunonutrition, especially containing eicosapentaenoic acid (EPA) may have an anti-inflammatory effect, reduce postoperative morbidity and infections after surgery as well as decrease hospitalization time. Therefore, ESPEN recommendations for surgery patients indicate benefits with intake of three bottles of ONS containing immunonutrients for 5–7 days before surgery. For patients with a high risk of perioperative complications, 10–14 days of nutritional support may be reasonable [1]. Similarly, diet containing polyunsaturated fatty acid (PUFA) is recommended in advanced colorectal cancer, extensive abdomen operation, head and neck cancer, during the perioperative period of cancer and major surgery [34]. Immunonutrition is recommended in cachectic patients and those before gastrointestinal (GI) and major surgery. In the study of lung cancer patients, EPA supplementation increased their quality of life and physical function [35].

Cachexia and pre-cachexia

ESPEN recommended fortified food and ONS for pre-cachectic and cachectic patients. Oral nutrition support enriched with anti-inflammatory ingredients may be considered [5].

Data from a study of mice suggest that branched-chain amino acids (BCAAs) may have a beneficial effect on progression of muscle mass wasting in experimental cancer cachexia. However, there are insufficient data to confirm this relationship in humans.

Furthermore, glutamine may have a beneficial effect on restoring the intestinal mucosa, stimulating intestinal villi to grow, and nourishing the intestines. Therefore, the addition of glutamine to ONS may be beneficial in patients with cancer cachexia [36].

Nutrition therapy containing fish oil may decrease weight loss in cancer cachexia [37]. Many studies of animal models suggest that omega 3 fatty acids play an important role in preventing body weight wasting and tumour growth in experimental cachexia [38]. Recent research focuses on the role of the microbiome in cancer cachexia. There is still no data on the specific role and composition of intestinal microbiome in cachectic patients, but studies of animal models show a relationship with the population of the microbiota and intestinal barrier function and cancer cachexia [39]. Therefore, ONS containing prebiotics (oligosaccharides such as galacto-oligosaccharides (GOS) and fructo-oligosaccharides (FOS) additive in these group seem to be justified.

Radiotherapy of the abdomen and pelvis

Radiotherapy of the abdominal and pelvic cavity may lead to many disorders of the digestive tract. In serious cases, it is necessary to use parenteral nutrition. When selecting the type of diet and route of supply of clinical nutrition, the following should be considered. Radiotherapy may cause nausea, vomiting, diarrhoea, constipation, abdominal pain, inflammation of the intestinal mucosa, microbiota disorders, water and electrolyte disturbances, gas, flatulence, and anorexia. Preparations for oral nutrition should have appropriate osmolarity and contain ingredients stimulating enterocytes and colonocytes for proliferation and regeneration. Excess monosaccharides, polyols, and soluble fiber can increase the risk of gas and bloating. Insoluble fiber may cause diarrhea and pain. A significant number of patients after radiotherapy may suffer from lactose intolerance, and there is a need for a gluten-free diet. Diet containing fiber in patients during radiotherapy is controversial. Previously, it was recommended to limit dietary fiber. However, current studies indicate the benefits of using soluble fiber as a substrate for the production of short-chain fatty acids (SCFAs) [40].

Fatty acids cause the regeneration of intestinal cells, reduce local inflammation and nourish and stimulate the growth of intestinal villi. Both ongoing cancer and radiation therapy cause a local inflammatory reaction in the intestines and a change in the microbiota [41]. Therefore, an adequate amount of soluble dietary fiber and ingredients that reduce inflammation will be beneficial [42, 43].

In patients undergoing radiotherapy, it is recommended to drink the preparations at room temperature and sip slowly throughout the day.

Chemotherapy

Chemotherapy may negatively affect nutritional status in cancer patients. Depending on the treatment and individual tolerance, patients may complain of nausea, diarrhoea, vomiting, changes in taste, changes in smell, xerostomia, malabsorption, dehydration, constipation, anorexia and significant weight loss. Referring to numerous publications, it may be concluded that the most commonly used formulations for oral feeding for patients during cancer treatment are high-energy and high-protein ONS. Formulations with the addition of omega-3 fatty acids are also recommended relatively often [44]. Cooling preparations can help with many ailments. However, it is not recommended in severe diarrhea. Frequent but low-volume intake of ONS will be beneficial. Depending on the patient, an intensely sweet preparation with a stronger smell or a neutral or odorless taste may be chosen. Hence, powdered formulations are often better tolerated. In case of constipation, ONS with increased dietary fiber content should be chosen. During diarrhoea,

particular attention should be paid to the choice of lactose-free ONS. The use of high-protein and PUFA-enriched ONS is an effective way to reduce weight loss, decrease lean tissue loss, and improve the quality of life in patients undergoing chemo(radio)therapy [44, 45].

BENEFITS OF ONS SUPPLY

ONS intake was associated with higher total energy intake of protein and reduction of malnutrition parameters compared to dietary advice alone. In other countries, the example being UK, patients do not have to pay for ONS. As food for special medical purpose, ONS may be prescribed by general practitioners [46].

Oral nutritional supplements in a randomized trial are more effective than dietary advice at improving the quality of life in malnourished care home residents [47].

Advantages; a relatively small volume being at the same time nutritionally high-dense, ready and possible to use in clinical or in home nutrition, easily digestible and increasing energy and macro-micro-nutrients intake in diet. Additionally, ONS may be lactose-free, gluten-free and the ones which do not contain purines or cholesterol. Influence on the patient's condition; reduce complication rate during medical treatment (surgery, chemotherapy, radiotherapy etc.), improve weight, and decrease mortality in malnourished patients. ONS may replace daily diet or can be used as nutritional support, can be served cold or mixed with warm food and do not need to be refrigerated before opening.

The use of powdered supplements or nutritional bars gives additional options for dietary therapy and reduces the risk of a monotonous diet. The undoubted advantages of using nutritional bars are: relatively low price, a variety of flavour or size, food ingredient additives, attractive appearance, easy to store, availability not only in a pharmacy. Powdered preparations can be combined in the form of shakes, fruit smoothies, mousses, desserts, sandwich spreads. The above solution will allow you to increase the nutritional density without the need to increase the volume of the meal. Powdered preparations are usually flavourless, they can have a neutral taste – which is beneficial in patients with disturbed taste and smell perception.

SIDE EFFECTS OF ONS AND DISADVANTAGES

Studies indicate that side effects of ONS are limited. However, incorrect use of ONS and choosing the wrong type of diet may have numerous serious consequences.

One of the barriers for ONS is the volume of bottle and necessity of using usually more than one. Therefore, sometimes it is useful to recommend low-volume but energy-dense ONS, especially in paediatric patients [48]. Research of nutritional support in elderly populations shows improvements of malnutrition parameters and good tolerance of low-volume and high-energy ONS, as well as high-calorie, high-protein ONS which improved the nutritional status [3].

In many studies, the adherence to ONS was unsatisfactory, but not in all observations [49–52]. Differences in compliance with

ONS recommendations were seen between various age groups. Hubbard et al. found a lower level of ONS adherence in older patients and indicated important factors of tolerance: smell, taste, temperature, and volume [50]. In contrast to the above results, compliance to ONS was on a higher level in the group of younger participants [53].

The effectiveness of ONS depends on patient adherence. High compliance to ONS has been correlated with greater energy intake and weight loss reduction [54]. Low acceptance of ONS was associated with frequently reported complaints such as diarrhoea and nausea after ingestion [55].

Palatability seems to be an essential determinant in acceptability and long-term adherence to ONS [56, 57]. Based on data from Nutrition Day 2018 in Poland and comparing data to an international reference database, it has been noticed that the lack of monitoring of the actual consumption of the hospital diet seems to be a significant problem. There is also the lack of control over the quantity and quality of food consumed apart from the hospital diet in a hospitalized patient (4.3% recorded that they “don't know” and 62.2% of the fields were not filled out compared to 0.31% of reference). Additional meals or in-between snacks to support adequate food intake of patients may be offered only in 50% of cases. In Poland, only 8.5% of patients took in protein/energy supplements during Nutrition Day compared to 13.8% in the reference group. To the question of how much hospital food the patients ate for dinner on the day of the Nutrition Day, 28.8% patients recorded that they ate ½ portion, 9.8% a quarter of meal and 10.4% nothing [58].

The following disadvantages may be listed; high costs, no reimbursement in Poland, difficulties in accessibility, many patients complain about a monotonous or too sweet taste. However, cooling the ONS may improve taste.

If ONS are overused or used inappropriately, they can cause many clinical ailments (Tab. I.) [53, 54, 59].

CONCLUSION

The above data indicate that the use of ONS as an adjunct to the patient's nutrition could reduce the risk of hospital malnutrition. Especially during the pandemic, with the connected inability to visit patients. In the time before the COVID-19 pandemic, the patient's family could bring him/her fresh and high-dense snacks. Moreover, nowadays, the patients themselves often cannot use hospital canteens due to the risk of coronavirus infection. Therefore, providing ONS in this case may contribute to the reduction of malnutrition, mortality and hospitalization period. Unless necessary, ONS should not replace the normal oral diet. It is important to routinely monitor the effectiveness of this kind of nutritional support and the correct kind of ONS chosen.

It is essential to consider disturbing disorders like taste and smell changes, which can be commonly reported in cancer patients [59].

Additional useful information

- Monounsaturated fatty acids may be helpful in increasing insulin sensitivity and normalizing glycaemia [60];

Tab. I. Aliments caused by incorrect use of ONS.

ALIMENTS	POTENTIAL CAUSE OF ALIMENT	ADVICE
Diarrhoea	Too cold ONS or taken out of the fridge, dysbiosis, ONS with high osmolarity, too much fiber, too much fat, drinking too much or too fast at once.	Drinking slowly, small portions during all day, choosing version with a lower osmolarity or without fat or lower protein level, selecting ONS at room temperature, adding ONS to meals.
Constipation	Not enough fiber, fluid, lack of physical activity.	Encouraging the patients to physical activity, recommending drinking fluids including water in an appropriate amount, choosing ONS with higher amount of fiber.
Nausea and vomiting	Dysbiosis, ONS with high osmolarity, too much fiber, too much fat, drinking too much or too fast at once.	Drinking slowly, small portions during all day, choosing versions with a lower osmolarity, chilled ONS may be better tolerated (even ONS ice cream!), finding ONS with the taste and smell that suits patients, mixing nutrient with meals, adding to fruit smoothies, sandwich spreads or soups, sometimes preparations with hydrolysed nutrients or without lactose or casein will be more tolerable, higher volumes of ONS, less sweet version, selecting powder options of ONS.

- Oral nutritional supplements containing sunflower and/or soybean oil provide omega-6 fatty acids. Excessive amount of this fat contributes to the increased production of inflammatory factors. The exception is high-oleic sunflower oil;
- It should be noted that not all ONS are lactose-free.
- Some formulations have an additive of sugar alcohols (polyols) which in excessive amounts may increase intestinal fermentation and cause bloating or gas;
- ONS manufacturers often indicate the purpose for a specific disease. Despite the same medical purpose, the ONS differ significantly between one another, e.g., ONS for diabetics had a different composition, volume and varied in nutritional value. Some were hypercaloric, others were normocaloric; some had increased protein content or added MUFA;
- Importantly, they also differ in osmolarity. Moreover, some of them may be complete, others incomplete; therefore special attention should be paid when recommending substitutes to patients;
- ONS with added dietary fiber usually do not contain much of it. They are often so small that in many cases there is no need to choose a fiber-free formula;
- Some preparations have a lot of fructose – long-term use of large fructose amounts may contribute to an increase in triglyceride levels and fatty liver;
- The maltodextrin contained in the composition may be derived from the hydrolysis of wheat. Careful checking of the label is necessary if a patient suffers from gluten intolerance.
- Most ONS can be cooled and even frozen. They can also be added to dishes, but they should not be exposed to high temperatures;
- It is critical that the patient is given specific trade names and/or indications as to the composition of the ONS he/she may consume;
- It is necessary to make sure the patient/patient's family know how they should be taken (how much and how often, what type and how), and how to store them;
- Patients and their family should be informed about different options (multiple companies), flavours, forms (powder, drink, jelly, yoghurt) and how to apply ONS as well as the differences in their composition;
- Patients and their carers should be educated that ONS are a kind of therapy, rather than ordinary snacks. Used wisely, they can have many clinical benefits. However, incorrect use is associated with numerous complications.

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