

It is important to realise that not all patients with diabetes are obese. Especially elderly patients are in many cases in fact undernourished

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Undernutrition – the untold story

WHAT IS THE FIRST IMAGE that comes to mind when you think of a person with diabetes? Is it someone who has to check their blood sugar levels regularly, or who needs to take insulin or medication and who needs a special diet, or is it someone who is overweight or obese?

Many of these images are typically associated with patients with diabetes, however not many of us would visualise a person with diabetes who is actually undernourished.

Incidence of diabetes and undernutrition

Diabetes currently affects 246 million people worldwide and by 2025 this number is projected to increase to 380 million. Equally, the problem of undernutrition is not uncommon.

UK studies show that up to 43% of patients in nursing home care are undernourished and one study found that 20% of patients on nutritional support had diabetes.¹ These statistics highlight the logical conclusion that as the incidence of diabetes increases, so too will the incidence of patients with diabetes that are undernourished.

Risk factors for undernutrition

The underlying causes of undernutrition in patients with diabetes are similar to those found in the general population. Firstly, there are conditions which result in reduced dietary intake including: difficulty chewing and swallowing, depression, difficulty preparing food and coping alone with isolation and loneliness.

The second group of conditions are those which cause increased nutritional requirements. For example, a number of patients with diabetes may have a neurological condition such as Parkinson's dis-



ease and Huntington's disease which are characterised by involuntary movements which increase energy expenditure.

Thirdly, some conditions may result in increased nutrient loss – so although the patient may be consuming sufficient quantities of food, their body is not getting the full benefit because some of the nutrients are lost. Nutrient loss can occur secondary to vomiting or diarrhoea, or the patient may have a gastrointestinal condition which is resulting in malabsorption or chronic blood loss (eg. via a gastric ulcer or diverticulitis).

Adverse effects

In the case of poorly controlled diabetes, a prolonged high level of glucose is toxic to metabolic processes and to cells. We all know that the consequences of acute hyperglycaemia can lead to blurred vision, fatigue and/or impaired mood/cognitive function. Furthermore, sustained hyperglycaemia is associated with micro- and macrovascular complications leading to increased morbidity and premature mortality.

Microvascular complications such as retinopathy, nephropathy and neuropathy are common in this patient group. Macrovascular complications, particularly coronary artery disease and stroke are significantly increased in diabetic patients.²

In addition to these complications, undernourished patients may experience decreases in activities of daily living, poor wound healing, increased incidence of depression and impaired immune function. Therefore both sides of the clinical spectrum needs to be considered to optimise treatment.

Treatment

The ideal treatment for undernourished patients with diabetes will consider both the management of the diabetes and the undernutrition itself. Treatment for this patient group must ensure the:

- Achievement of good glycaemic control
- Prevention of long-term complications
- Management of hyperlipidaemia
- The treatment of malnutrition.

Undernourished patients with diabetes are in need of additional energy, protein and micronutrients in their diet. Dietary guidelines of diabetes organisations such as the American Diabetes Association (ADA) and The Diabetes and Nutrition Study Group (DNSG) of The European Association for the Study of Diabetes (EASD) focus on the 'healthy' diabetic patient group.

Nevertheless, these recommendations can be partly applied to undernourished patients with diabetes who need special enteral nutritional support. These nutritional guidelines provide advice on carbohydrate, fibre, fruit, vegetable intake (vitamins and minerals), fat and protein

(see Table 1).

In patients with general undernutrition, nutritional support in the form of oral nutritional supplements (ONS) or tube feeds is recommended.³ ONS are prescribed to enhance a patient's intake of protein and energy. They are not designed as meal replacers but as nutritional support. Recent studies found that ONS do not affect the patient's appetite.^{4,5}

Nutritional formulations (ONS or tube feed) that have been specifically designed for patients with diabetes are the first choice treatment. These diabetes-specific formulas are enriched with monounsaturated fats and fibre and have a low glycaemic index.

The benefits of diabetes-specific formulas are outlined in Table 2.

The benefit of these diabetes-specific enteral formulas is clearly demonstrated in a systematic review published in 2005.⁶ This systematic review found that the short and long-term use of diabetes-specific formulas as oral supplements and tube feeds significantly improved glycaemic control compared with standard formulas and provoked a lower glucose response and less hyper- and hypoglycaemic states than standard formulas.⁶⁻¹⁰

These results are highly significant; the achievement of glycaemic control is essential since the state of hyperglycaemia is associated with a higher mortality rate (16% vs. 2%; $p < 0.001$) a longer length of stay in hospitals (9 vs. 5 days; $p < 0.001$) a higher infection rate (2.7 times higher ($p < 0.05$)).

If a patient requires tube feeding, the following factors should be considered:

- Method of delivery – if a patient needs to be tube-fed, there is a choice between bolus feeding and continuous feeding. It is important to match the feeding choice to insulin regimen where relevant
- Medical management of hyperglycaemia – it is important to consider the type of diabetic medication the patient is on (ie. oral hypoglycaemic agents or insulin). The duration and peak of action of the medication needs to be taken into account when deciding on the feeding regimen
- Gastric emptying – this is delayed in 30-50% of patients with long-standing diabetes and this will affect the rate at which the feed is digested.

Patients that will benefit from diabetes-specific nutritional supplements

Patients with hyperglycaemia, with a functional gastrointestinal tract who are unable or unwilling to eat sufficient or recommended quantities of conventional

Table 1

Dietary recommendations for diabetes patients by the ADA and the DNSG/EASD^{17,18}

Year	Protein En%	CHO En%	Fat En%	SAFA/PUFA En%	Fibre En%
ADA 2006	15-20	45-65	25-35	< 7/< 10	Yes
DNSG/EASD 2004	10-20	45-60	<35	< 10/< 10	Yes (20g/1000kcal)

CHO = carbohydrate

SAFA = saturated fatty acids

PUFA = polyunsaturated fatty acids

En% = percentage of daily requirement from

Table 2

Benefits of diabetes-specific feed compared to standard feed

- Significantly lower postprandial rise in blood glucose (1.03mmol/l)
- Significantly lower peak blood glucose (1.59mmol/l)
- Significantly lower glucose AUC (7.96mmol/l*min) in diabetics

Some outcomes were only measured in a limited amount of studies. Therefore, no meta-analysis could be done but trends could be measured:

- A trend showing that insulin requirements are reduced
- A trend to lower HbA1c and fructosamine
- A trend to lower incidence for upper respiratory tract infection

foods to meet their daily requirements will benefit from diabetes-specific nutritional supplements.

The main patient groups are diabetic patients (type 1 and type 2) and patients with impaired glucose tolerance. Diabetes-specific formulas provide them with all necessary nutrients without provoking unwanted postprandial hyper- and hypoglycaemic states.

Elderly patients with diabetes are especially at high risk of nutritional depletion and the importance of enteral nutrition as a means of nutritional support has been re-emphasised in several publications.^{1,11-14} Diabetes-specific formulas help to prevent or reverse this depletion state and to improve quality of life

In severely stressed patients, the immobility, anorexia, anabolic inefficiency and increased metabolism promote the development of malnutrition, which needs to be prevented by nutritional intervention. Furthermore, infection, trauma or surgery provokes a stress response leading to accelerated catabolism, hepatic gluconeogenesis and lipolysis.

The end result of these processes is an

increase in levels of serum glucose, free fatty acids and ketone bodies. This stress response may also result in acidosis, which leads to impairment in peripheral insulin sensitivity.¹⁵

Tight glycaemic control in critically ill patients has been shown to significantly reduce morbidity and mortality.¹⁶

Optimal treatment

Often what is at the forefront of our minds is what is brought to our attention by the media or what surrounds us. There is no arguing that obesity is a large contributing factor to the increased incidence of diabetes and that in future years it will cost the healthcare system significant resources to treat.

However, not every patient with diabetes will fall into the category of the obese patient and we must ensure that undernourished patients with diabetes receive optimal treatment from both a nutritional and diabetes perspective. Diabetes specific formulas deliver improved results over standard ONS in these incidents.

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References on request