



Dietary treatment of adult patients with Cystic Fibrosis Related Diabetes

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Patients with Cystic Fibrosis Related Diabetes (CFRD) have a lower life expectancy than other patients with CF; this is especially true in women (1). Treatment with insulin appears to increase life expectancy because of its effects on nutritional status and lung function (2). Dietary treatment of patients with CFRD is a challenge for dietitians because of the conflicting recommendations in CF guidelines and diabetes guidelines. (Table 1)

Table 1 Conflicting recommendations in Dutch Elsevier diet protocols for cystic fibrosis (2002) and diabetes mellitus (1998)

¹ Recommended daily allowance

² Percentage of daily energy from

Cystic Fibrosis	Diabetes Mellitus
120 -150 % RDA⁽¹⁾ for energy	100 % RDA⁽¹⁾ for energy
35 – 40 en %⁽²⁾ fat	30 en %⁽²⁾ fat: <10 en % saturated fat
15 – 20 en %⁽²⁾ protein	10 – 20 en %⁽²⁾ protein
40 – 50 en %⁽²⁾ carbohydrates	50 – 60 en %⁽²⁾ carbohydrates

Most patients with CF need dietary treatment from a young age before they have developed CFRD. Thanks to nutritional therapy and improved medical treatment, patients with CF are getting older, which increases the prevalence of CFRD. Weight loss (due to urinary loss of glucose) can be an indicator for CFRD. After CFRD has been diagnosed, the dietitian is faced with a dilemma: should dietary treatment be modified to decrease the risk of diabetes-related complications such as cardiovascular disease? In other words, should the dietitian advise less energy, a different kind of fat or less fat? These measures

are common in the typical western obese diabetes patient, but may not be suitable for a lean patient with CF.

We investigated which dietary goals have priority in Dutch patients with CFRD and constructed new evidence based dietary guidelines based on international dietary guidelines for CFRD (6).



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Aim of the study

We performed a literature study to investigate priorities in the dietary treatment for adult patients with CFRD.

Methods

The literature study was based on papers found in the databases Pubmed (from 1988 to the present) and Cochrane, resulting in draft recommendations. These draft recommendations were discussed and amended in November 2006 by the eight members of the Dutch working group “Adult Cystic Fibrosis Specialist Dietitians” resulting in a final guideline.



Results

Twenty three papers on the detection and treatment of CFRD were found and one evidence-based dietary guideline. No meta-analyses or randomised controlled dietary intervention trials were found. Therefore, recommendations are based on cohort studies and current clinical practice reported in clinical consensus guidelines.

Dietary recommendations could be divided into general recommendations - for the whole group of CFRD patients - and specific recommendations for selected groups based on body weight and blood lipid levels. The general dietary recommendations are for insulin treatment, the amount of protein, fat and dietary fiber. Specific recommendations concern the intake of energy and carbohydrates and types of dietary fat.

General Recommendations

Insulin treatment has been shown to have several positive effects: normalisation of blood glucose, increase of lung function, decrease in incidence of infections and anabolic effects on protein metabolism (5, 6, 11, 12, 13). Therefore all patients with CFRD should be treated with insulin.

Protein metabolism is affected in CFRD: Proteolysis is increased. For protein intake no restrictions are advised to avoid catabolism of body protein stores which would impair nutritional status. Even in patients with microalbuminuria a minimum of 0.8 – 1.0 g protein/ kg body weight is recommended (5, 6, 9, 11, 12).

The recommendation for fat intake is 35-40 en% for all CFRD patients, irrespective of BMI or blood lipids. Fat is an important energy source, and therefore no restriction in the amount of fat is imposed to avoid weight loss and subsequent impairment of nutritional status (4-9, 11, 15, 16). However, with increased longevity it may be prudent to advise patients on the types of dietary fat, especially when blood lipids are disturbed (see "specific recommendations") (6).

The recommendation for the use of dietary fiber is 3 g/ MJ. Dietary fiber improves regulation of blood glucose and has beneficial effects on lipid metabolism (6, 14). Moreover, soluble fibers have been shown to delay the rate of postprandial glucose absorption and have beneficial effects on lipid metabolism (6).

On the other hand, foods containing dietary fiber tend to have a low energy density, provide bulk to a meal and promote fullness and satiety. Fiber-rich foods should never compromise energy-intake in underweight CFRD patients.

Specific Recommendations

Maintenance of a healthy body weight (in other words: preventing weight loss) is an important predictor of survival in CF patients. We found no evidence that this would be different for CFRD patients. Most of the well treated patients with CFRD gain weight. To avoid the development of overweight, the normally advised 120 -150 % of RDA for energy (5) may not be necessary. Therefore the recommendation of energy can be adjusted based on different groups of BMI (weight (kg)/length (m²).

Based on the available literature and experience-based criteria of specialist CF dietitians, we decided on specific recommendations for groups with different body weight and blood lipids. The specific recommendations are summarized in a flow chart. (Figure 2)

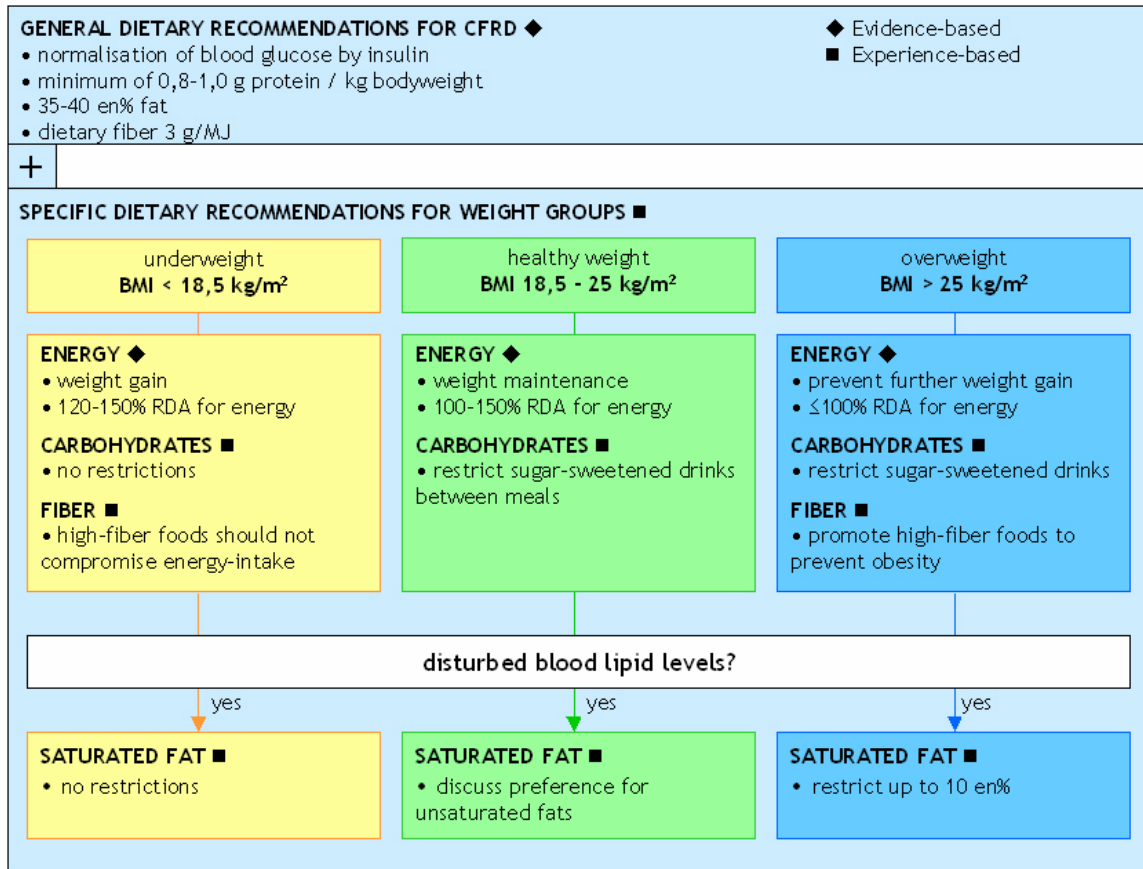


Figure 2 Flowchart for selecting the appropriate dietary treatment of adult patients with CFRD

Specific Recommendations for CFRD patients with a BMI below 18.5.

Priority in this group to improve survival is weight gain through an energy-rich diet of 120 -150% RDA (3). The intake of carbohydrates should not be restricted to avoid deficits in energy intake. However, to stabilize blood glucose values, counting the amount of carbohydrates is recommended, and insulin should be adjusted to that amount (5). The intake of dietary fiber is not emphasized in this group to avoid that high fiber foods compromise energy intake. Increased serum cholesterol and triglycerides are not common in CF-patients (10) so no restrictions in dietary saturated fat will be necessary in most patients. Even in patients with disturbed blood lipid levels no restriction on saturated fat is recommended because cardiovascular disease rarely occurs in adults with CFRD (5, 9, 11).



Specific Recommendations for CFRD patients with a BMI from 18.5 to 25.

A healthy body weight is important to maintain (5). To avoid fluctuations in blood glucose levels, the consumption of sugar sweetened drinks should be restricted between meals. When taken with meals the amount of fast acting insulin should be increased accordingly (4, 5, 10, 12). We found no evidence for restriction of other carbohydrate-rich food groups, but counting carbohydrates to adjust insulin doses is crucial. There is no evidence that CFRD patients have a higher risk for heart disease than CF patients without diabetes; so no restriction for saturated fat appears to be necessary (8). However, it has been suggested that in older CFRD patients macro vascular disease may become an important issue (10, 12). So when in this group blood lipid levels are disturbed it appears prudent to discuss the preferential use of unsaturated fats (4).

Specific Recommendations for CFRD patients with a BMI higher than 25.

Priority in this group is to prevent further weight gain. The energy recommendation can be lowered in this group to < 100% RDA (4). Carbohydrates are an important source of energy but should be moderated to decrease energy intake and prevent fluctuations in blood glucose levels (4, 13). High fibers foods are recommended for this group because dietary fiber provides bulk to a meal which will promote fullness and satiety (6). Hyperlipidemia can occur in CFRD patients after lung transplantation and use of medication (oral steroids). So when, in this group, blood lipid levels are disturbed it appears prudent to restrict the caloric contribution of saturated fat to 10 % of the total energy intake (based on recommendation for the general population) to avoid the possible future development of macro vascular complications in CFRD patients who live longer.

Conclusions

Based on the literature we found that CFRD requires a specific dietary guideline that contains elements of guidelines for the dietary treatment of CF and diabetes. The patient's body weight and blood lipid levels determine the priorities in dietary treatment. We developed a flowchart for selecting the appropriate dietary treatment based on the following data:

- Adequate control of blood glucose appears to be no different from normal (non-CF) diabetes.
- Energy recommendations are higher in the majority of patients with CFRD than in healthy adults to maintain body weight.
- Saturated fats should not be restricted if BMI < 18.5 because long term effects on heart disease in this group of patients with CFRD are unknown. Adequate energy intake has a priority in this group.

Evidence suggests that adequate treatment of patients with CFRD with these dietary recommendations will improve their nutritional status and long term health.

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