



European *Dietitians*

Briefing Paper on the Role of the Dietitian in the Prevention and Management of Gestational and Type 2 Diabetes Mellitus

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Dietitians, as members of integrated multidisciplinary teams, have a central role to play in the prevention and management of diabetes in both adults and children at every stage of the disease course¹. Dietary and lifestyle modification are considered the cornerstones of effective diabetes prevention and self-management. Dietitians are uniquely qualified to translate the science of nutrition and apply it to nutrition counseling, promoting healthy nutrition in diabetes, and to public health initiatives, reducing the burden of preventable disease through good nutrition.

Diabetes

Diabetes is a chronic illness caused by no or an insufficient production of insulin by the pancreas, or when the body is unable to effectively use the insulin produced. This then leads to increased blood glucose levels (hyperglycemia). Sequela associated with hyperglycemia include cardio-vascular disease, nephropathy, retinopathy and neuropathy².

Diabetes is a complex condition requiring both high quality clinical care and effective self-management. All individuals with diabetes need to be actively involved in developing their own, unique care plan, which includes meeting their own and their family/carers' educational needs². With access to the appropriate education, medication, quality of care and good medical and nutritional advice, people with diabetes should be able to lead an active and healthy life and reduce the risk of developing complications and the associated reduction in life expectancy and quality of life³.

The key therapeutic aim is to achieve metabolic control, which means not just maintaining target blood glucose levels as close to normal as possible, but also achieving optimal blood pressure and lipid levels²⁻⁴. Care also includes regular monitoring and early detection and management of complications². Effective self-management and quality of life are key outcomes of diabetes self-management education and should be measured and monitored as part of care⁵. Since emotional wellbeing is associated with beneficial diabetes outcomes, psychosocial issues should also be addressed².

- *Gestational diabetes (GDM)* is a form of diabetes consisting of high blood glucose levels during pregnancy. It develops in one in 25 pregnancies worldwide and is associated with complications mainly in the period immediately before and after birth and linked with age, parity, ethnicity and obesity. After pregnancy women with GDM and their offspring are at a significantly increased risk of developing type 2 diabetes later in life; approximately 50% of women with a history of GDM develop type 2 diabetes within five to ten years after delivery.
- *Type 2 diabetes* accounts for approximately 90% of all cases of diabetes. It is characterized by insulin resistance and relative insulin deficiency, either of which may be present at the time that diabetes becomes clinically manifest. The diagnosis of type 2 diabetes usually occurs after the age of 40 but can occur earlier, especially in populations with high genetic predisposition and/or obesity levels. Type 2 diabetes can remain undetected for many years and the diagnosis is often made from associated complications or incidentally through an abnormal blood or urine glucose test.



Approximately 20% have complications at diagnosis (UKPDS). Type 2 diabetes is associated with obesity; 80% of adults with type 2 diabetes are overweight or obese and the risk of developing diabetes increases with both increasing body mass index and waist circumference^{6, 7}.

Key therapeutic goals of dietetic interventions

- Support the maintenance of metabolic control, to prevent the development of complications, including :
 - lowering of body weight by 5-10% in case of overweight or obesity,
 - maintenance of blood glucose levels in the optimal range (preventing hypoglycemia and hyperglycemia),
 - optimize the lipid profile,
 - maintenance of blood pressure within the normal range
- Adjust meal plans/advice on adjustment of dietary intake to oral medication or insulin regimen.
- Provide specialist advice where insulin doses may need to be adjusted where changes to typical carbohydrate/meal patterns occur, e.g. illness or for individuals living in institutionalised settings.

Diabetes in the EU

Diabetes affects over 55 million people in Europe. In addition another 66 million citizens have impaired glucose tolerance, with a high probability of progressing to clinically manifest diabetes⁸. The number of people affected by diabetes in Europe is expected to increase to over 64 million by 2030, as a result of the obesity epidemic and an ageing European population⁸. Over 600,000 deaths per year are attributed to diabetes in the EU, and in most EU countries diabetes accounts for over 10% of healthcare expenditure⁸.

Given that type 2 diabetes is partially a preventable disease, EU countries should strive to use environmental, food and consumer policies to tackle known risk factors such as obesity. Also adequate education on healthy nutrition and promotion of physical activity in association with early diagnosis can act preventively.

Dietary guidelines for diabetes

Dietary modification is one of the cornerstones of effective diabetes management.

European diabetes dietary guidelines vary in the contribution of macronutrients to energy intake recommended. Some guidelines do not specify % energy from macronutrients and instead focus on overall caloric deficit⁹. Others recommend a relatively high carbohydrate diet (40-60% of energy intake) with emphasis on high fibre, low glycaemic index foods^{4, 10} through to. The total amount of carbohydrate consumed at meals, regardless of whether the source is sucrose or starch, is the primary determinant of postprandial glucose levels¹¹. For individuals with diabetes, the use of the glycemic index (GI) and glycemic load may provide a modest additional benefit for glycemic control (~0.5% HbA1c reduction)¹² over that observed when total carbohydrate is considered alone. Studies are complicated however by differing definitions of high or low GI diets, as well as possible confounding dietary factors¹³. Care should be taken, when advising on GI, to ensure the overall quality of the diet meets low saturated fat, high fibre dietary recommendations. The primary goal with respect to dietary fat is to limit overall fat intake (<35% of energy intake) with focus on decreased saturated, trans-fatty acids and cholesterol intakes to reduce the risk of cardio-vascular disease⁴. Protein intake in adults with type 2 diabetes with normal renal function should constitute 10-20% of energy intake. A reduction of the protein intake to 0.8-1 g/kg/day in individuals with

diabetes and an earlier stage of chronic kidney disease (CKD) and to 0.8 g/kg/day in the later stages of CKD may improve renal function (urine albumin excretion rate and glomerular filtration rate)^{2, 14, 15, 16}.

Weight management should be the primary nutritional strategy in managing glucose control in type 2 diabetes for people who are overweight or obese^{9, 10}. Focus should be on total energy intake for weight reduction and low-carbohydrate, low-fat calorie-restricted, and Mediterranean diets may all be effective for weight loss in the short term (up to 2 years)¹⁷. The importance of energy balance or energy restriction in combination with an active lifestyle (2000-2500 kcal per week physical activity) to obtain weight loss in overweight individuals should also be emphasized¹⁸⁻²¹.

In practice healthy eating tools such as food plates, food pyramids and food wheels are used to encourage consumption of wholegrain carbohydrate foods, fruit and vegetables, low fat dairy, lean protein sources and discourage excessive consumption of high energy foods⁴.

Role of the dietitian: diet

Diabetes education is best provided by an integrated multidisciplinary team including, the person with diabetes, a nurse, a dietitian, a psychologist and a physician who are skilled in diabetes prevention and management as well as educational, behavioral and psychosocial strategies. It is essential in this collaborative and integrated team approach that individuals with diabetes assume an active role in their care³.

Dietitians play varied roles within diabetes teams. They work as trained diabetes educators within diabetes self-management-education programs²²⁻²⁴. Dietitians also provide individualized therapy and counseling related to nutrition in both one-to-one and group based settings with patients, taking into account personal and cultural beliefs, preferences, lifestyle, willingness and ability to change^{9, 24, 25}. Dietitians are highly skilled educators and lifestyle coaches; supporting and empowering individuals with diabetes to make healthy food choices, lead an active lifestyle and meet their personal and medical, short and long term goals^{9, 25}. Dietitians working in diabetes also play key roles advising on overweight and obesity management, encouraging increased activity, interpreting glucose self-monitoring records and advising on how best to integrate medications management with the patients' diet and lifestyle^{9, 26, 27}. Maintaining or improving quality of life is a core patient-centered outcome in all dietetic interventions⁹.

In elderly care homes and institutions, where patients may have limited food choices, the dietitian plays a role in identifying, together with the treating physician and the kitchen staff, a diet that ensures good metabolic control and the highest quality of life for the person with diabetes²⁸.

The role of the dietitian in the management of gestational diabetes is particularly important^{29, 30} given that the prescription of dietary treatment can help to normalize blood glucose levels, prevent and minimize complications in pregnancy and during delivery and can help to prevent or delay the need for insulin therapy. In combination with the provision of an adequate nutritional intake, it will allow for normal development of the fetus. Optimal maternal nutrition is critical during pregnancy for normal fetal growth and development and it becomes even more important in the face of GDM as poor glycaemic control can result in macrosomia and various obstetric complications. The role of the dietitian at this time is invaluable as intensive nutritional and lifestyle counseling, appropriate to the patient's cultural beliefs and food preferences, has the potential to positively influence glycaemia and pregnancy outcomes. However, there is currently a lack of consensus on the nature and

definition of dietetic therapy for GDM patients across Europe and clarification and clear guidelines in this area are required. In 2001, the American Dietetic Association published practice guidelines for care of women with GDM³¹ and the effectiveness and impact of these guidelines were later evaluated in comparison to 'usual' GDM care without specific dietetic goals or guidelines²⁹. The results of this study demonstrated less insulin use and improved glycaemic control among patients attending clinics where the nutrition practice guidelines were implemented, thus supporting the need for adequate dietetic intervention in GDM care. Specific dietitian-led low glycaemic index interventions for women with GDM and hyperglycaemia in pregnancy have also demonstrated positive effects on insulin requirements³² and glycaemic control³³.

Diabetes interventions involving dietitians have proven efficacy for improving a range of outcomes in type 2 diabetes. Group education and care, delivered by trained dietitians and nurses is associated with significantly lower HbA1c (7.6% vs. 8.4%, $p < 0.05$), decreased insulin resistance (Homeostasis Model Assessment index 6.9 vs. 9.2, $p < 0.05$) and better quality of life (65 vs. 78.4, $p < 0.001$) than those obtained by a medically and pedagogically qualified team²². In sub optimally controlled type 2 diabetes (HbA1c $> 7\%$) despite optimised hypoglycaemic drug treatment, a dietitian-led intervention was shown to significantly improve glycaemic control, weight and waist circumference and led to a significant decrease in saturated fat intake, compared to controls³⁴. In type 2 diabetes patients commencing insulin, dietitians may play an invaluable role in delivering interventions that attenuate the weight gain usually associated with insulin therapy³⁵. Intensified lifestyle interventions has been shown to be equivalent to insulin treatment in poorly controlled type 2 diabetes for up to one year³⁶, and may have more beneficial effects on adipokine levels than when the same lowering of HbA1c is achieved with insulin treatment³⁷. Dietitian-led interventions involving more specialised interventions - for example the use of meal replacements in the Look AHEAD Study - also result in significant weight loss and improvement in glycaemic control³⁸.

There is also evidence that dietary interventions involving dietitians are effective in reducing progression to type 2 diabetes in pre-diabetes²³. The Diabetes Prevention Programme³⁹ showed a 58% reduced risk of developing type 2 diabetes with an intensive lifestyle intervention. Within this intervention, dietitians worked as lifestyle coaches, (addressing eating, activity and behavioural strategies for diabetes prevention) as well as case managers and active researchers on various aspects of the study²³. Since the dietitian plays a significant role in the prevention of type 2 diabetes, primary care physicians should refer patients with symptoms of glucose intolerance and diabetes to a dietitian to ensure the best care for their patients^{39, 24}. Most importantly, such interventions are proven to be cost effective⁴⁰.

Role of the dietitian: physical activity

Since physical activity/exercise is a cornerstone of effective diabetes prevention and management^{2, 20, 41-43}, dietitians should encourage their diabetes clients to engage in regular physical activity.

Regular exercise in diabetes has a number of important advantages²⁰:

- Better glucose uptake at muscular level.
- Prevention of cardiovascular disease.
- Less likely to gain weight.
- Increased fat oxidation.
- Better condition/fitness.
- VO₂max (maximum oxygen uptake) increases.
- Better psychological well-being and quality of life.



Regular physical activity (150-180 minutes/week) of moderate intensity exercise improves glucose uptake, fat oxidation and improves lipid metabolism²⁰. Moreover regular exercise decreases insulin requirements and improves insulin sensitivity. The effectiveness of the training on glycaemia and lipids is strongly dependent on the type of training. Endurance training (at sufficient intensity) improves fat metabolism, while strength or intensive interval training improves glycaemia. Therefore a combination of strength and endurance training is best²⁰.

Self-monitoring tools such as pedometers or accelerometers may also be useful for promoting physical activity in type 2 diabetes^{44, 45}

Glycaemia during exercise is dependent on insulin levels and blood glucose levels when starting the activity, the duration and intensity of the activity; and the use of carbohydrates during exercise. Regular blood glucose testing before, during and after exercise, is important for individuals to learn the impact of activity on glycemia. It is good practice to always carry a rapid acting glucose source when engaging in exercise and to have someone at hand who knows the symptoms and can assist in the treatment of hypoglycaemia should it occur²⁰. Persons with type 2 diabetes not using insulin or insulin secretagogues are unlikely to experience hypoglycemia related to physical activity²⁰. Users of insulin and insulin secretagogues should be given the opportunity to receive specialist advice regarding diet, insulin doses and exercise as adjustments to carbohydrate/insulin doses may be necessary to prevent hypoglycemia during and after exercise²⁰.

Individuals who are managed on insulin. From clinical experience doses may need to be revised and adjusted in response to planned physical activity.

For overweight people with diabetes and individuals with impaired mobility, risk analysis and condition testing with a healthcare professional is essential prior to starting an exercise program²⁰. More general guidelines for physical activity also apply for people with diabetes e.g. any physical activity needs a proper warm-up and cool-down and comfortable shoes are essential to prevent blisters and foot problems.

Reducing sedentary behaviour ('too much sitting') has recently become a target for behavioural scientists - it is of particular interest in diabetes as it has been shown the breaking up prolonged sitting in obese adults reduces postprandial glucose and insulin responses^{46, 47}. There is a growing body of evidence that suggests breaking up sitting time approximately every 30 minutes can improve weight and metabolic outcomes⁴⁸.

Exercise (30 minutes a day at a moderate intensity, with a maximum of 1 h) is for a pregnant woman with diabetes an ideal tool to reduce postprandial hyperglycemia. As long as the heart rate is in a safe range, aerobic exercise such as walking, cycling or swimming are considered safe. Sufficient water intake and light clothing are also recommended as maintaining normal body temperature is important during pregnancy⁴⁹.

Age	Safe heart rate range
<20 years	140-155
20-29	135-150
30-39 years	130-145
> 40 years	125-140



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Addendum

*Key performance indicators for diabetes management*⁵⁰

- Physical
 - blood pressure
 - BMI
 - body weight
 - waist circumference
- Biochemical
 - Hb A1c
 - blood lipids
 - renal function
 - folic acid
 - vitamin B12
 - vitamin D
- Psychological
 - quality of life
- Behavior change
 - healthy eating habits
 - physical activity
- Physical
 - blood pressure
 - BMI
 - body weight
 - waist circumference

Best practices in counseling methodologies for diabetes management by European dietitians.

A range of psychological interventions have been shown to improve glycaemic control in type 2 diabetes, including motivational interviewing and cognitive behavioural therapy techniques⁵¹. Studies indicate that instructors without specialised training in diabetes, behavioural interventions and counselling skills may not focus on patient behaviour change, and therefore, clinical outcomes may not improve⁵². Dietitians' clinical training involves instruction in behaviour change strategies and this is associated with improvement in metabolic outcomes and dietary and activity behaviours⁵³⁻⁵⁵.

As the number of people with diabetes increases worldwide, there will be an increasing need for diabetes education. New approaches are necessary to ensure the cost-effective provision of this education for people with diabetes. Diabetes education needs up-to-date programmes to train educators in order to deliver high quality diabetes education. The International Standards for Diabetes Education offer a basis on which to develop courses, while providing criteria against which to measure programme contents⁵⁶.

- Techniques to help improving motivation and behavioral change
 - effective coaching (self-determination theory)
 - cognitive behavioural therapy
 - motivational interviewing
 - situational coaching
 - discount rates (http://painconsortium.nih.gov/symptomresearch/chapter_4)
 - mindful eating
 - patient empowerment



- problem solving therapy
- self-monitoring
- systemic approach
- Workshops
 - healthy nutrition
 - carbohydrate awareness
 - nutri learn buffet
 - alimentary sensations (hunger, satiety, craving)
 - menu planning
 - how to read food labels
 - healthy shopping
 - the physical active person with diabetes
- Cooking classes
- Visualization tools used in education
 - pictures of food portions
 - food composition tables
 - websites and apps used to count calories and promote healthy nutrition e.g. (cave: which nutrient table is the used? - different for ipad, android, iphone)
 - Carbs and Cals
 - Diabetes Dog
 - Diabetes Pilot
 - Dbees
 - HelpDiabetes
 - Koolhydraatkenner
 - Sweetbee
 - animated lectures
 - food plates/pyramids/wheel models
- Infotainment games
 - quartet
 - quizzes
 - food 'dummies'
- Food diaries
- Tele-coaching
- Visualization tools used in education
 - animated lectures
 - food plates/pyramids/wheel models
- Tools that are helpful in promoting physical activity
 - a heart rate meter (e.g. Polar),
 - a pedometer (e.g. Digiwalker),
 - an accelerometer.
 - apps to optimize physical activity
 - MyfitnessPal
 - Runkeeper



Further Reading

- www.ecdiabetes.eu
- www.europarl.europa.eu/news/en/pressroom/content/20120313IPR40731/html/Parliament-calls-for-EU-diabetes-strategy
- <http://archive.diabetesatlas.org/content/europe>
- www.lookaheadtrial.org

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