Challenges of coeliac disease in type 1 diabetes

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Coeliac disease is more prevalent in people with type 1 diabetes but symptoms may be absent or nonspecific, which can lead to it going undiagnosed. Diagnosis is, however, essential to allow treatment and prevention of complications. There are special management considerations when seeing an individual who has both coeliac disease and type 1 diabetes.

Coeliac disease is more common in people with type 1 diabetes and potentially has a large impact on the health and lifestyle of an individual who simultaneously needs to manage their diabetes. The general practitioner plays a central role in the timely diagnosis of coeliac disease, the commencement of a gluten-free diet (with the involvement of a dietitian who is skilled in both diabetes and coeliac disease) and the detection and management of the complications of coeliac disease. The physiology and management of these two conditions interact to create additional challenges for both the patient and the general practitioner.

Key points

- **Coeliac disease is more common in people with type 1 diabetes than in the general population and it is essential that it is diagnosed and treated.**
- **Treatment of coeliac disease with strict adherence to a gluten-free diet allows resolution of symptoms and the investigation, treatment and prevention of complications.**
- **Having both type 1 diabetes and coeliac disease can pose many difficult challenges for patients.**
- **Education and guidance from an Accredited Practising Dietitian experienced in both type 1 diabetes and coeliac disease is vital.**

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What is coeliac disease?

Coeliac disease is an immune-mediated gluten-sensitive enteropathy. Gluten-containing grains include wheat, barley and rye. The main sources of gluten in the diet come from breads, cereals, pasta, biscuits, cakes and pastries made with gluten-containing ingredients, which by their nature are also sources of carbohydrate. Ingestion of the gluten proteins causes a T-cell-mediated intestinal inflammatory response resulting in flattening of villi of the small intestine (villous atrophy). This leads to nutrient malabsorption, including of iron, folate and vitamins D and B_{12}.

Because of shared genetic and environmental factors, coeliac disease is much more common in people who have type 1 diabetes than in the general population. The prevalence of coeliac disease in those with type 1 diabetes is approximately 8%.[1] The prevalence of coeliac disease in the general population is commonly reported at approximately 1%,[2] although recent research in an Australian setting shows it to be even more prevalent, particularly in women.[3] In more than 90% of cases where type 1 diabetes and coeliac disease coexist, the diagnosis of type 1 diabetes is made first.[4] However, it is suspected that in many individuals the coeliac disease may go undiagnosed for some time, and symptoms are only recognised in retrospect.

What are the potential consequences of coeliac disease?

Coeliac disease can be asymptomatic or an individual may have general malaise, fatigue or gastrointestinal symptoms of abdominal bloating, pain, diarrhoea or constipation. Anaemia due to malabsorption of iron and vitamin B_{12} is a problem that commonly triggers investigation leading to diagnosis. Malabsorption of other nutrients can cause vitamin D deficiency, osteopenia or osteoporosis and, in children, poor growth and delayed puberty. There is increased risk of gastrointestinal tract malignancy, including small bowel non-Hodgkin's lymphoma.

Extraintestinal complications include hepatocellular dysfunction, depression and a range of neurological manifestations, including headaches and peripheral neuropathy. Women can have problems with fertility and miscarriage. Coeliac disease can be associated with rheumatological and dermatological conditions and with autoimmune endocrine conditions other than type 1 diabetes, such as autoimmune thyroid disease and Addison's disease.

Of significance, increased mortality has been reported in patients with undiagnosed coeliac disease, and the combination of long-standing coeliac disease and type 1 diabetes is associated with increased mortality compared with having type 1 diabetes alone.[5,6] The role of coeliac disease on the development of diabetic complications is mixed, being either protective or aggravating.[7]

Diagnosing coeliac disease

Initial testing is with coeliac serology (e.g. IgA and IgG antibodies to tissue transglutaminase and deamidated gliadin peptide) and measurement of total IgA level. If an individual is found to have IgA deficiency (which occurs in 3% of people with coeliac disease), interpretation of serology relies on IgG antibody levels.[2] If coeliac serology is positive, gastroscopy with small bowel biopsy is essential for confirmation because false-positive coeliac serology can occur. Small bowel pathology showing villous atrophy and inflammation confirms the diagnosis of coeliac disease. Importantly, the patient must be on a gluten-containing diet for at least six weeks before biopsy to reduce false-negative results.

HLA gene testing (*HLA DQ2* and *HLA DQ8*) has only a limited role in diagnosing coeliac disease. It may be used in patients in whom coeliac serology or small bowel biopsy results are unclear: if the gene testing result is negative then coeliac disease is very unlikely; however, a positive gene testing result is unhelpful because the overwhelming majority of people with a positive result do not have coeliac disease.

1. Useful websites for information on coeliac disease and diabetes

Australian Diabetes Council
www.australiandiabetescouncil.com

Coeliac Australia
www.coeliac.org.au

Dietitians Association of Australia
www.daa.asn.au

Diabetes Australia
www.diabetesaustralia.com.au

Management of coeliac disease in type 1 diabetes

The management of people with coeliac disease involves strict and lifelong adherence to a gluten-free diet together with identifying and managing the complications of the disease as well as considering the possibility of coexisting associated conditions. Although it can be challenging for patients, strict adherence to a gluten-free diet is necessary. The regular inclusion of even very small amounts of gluten in the diet is enough to cause significant symptoms in an individual with coeliac disease, with ongoing damage to the small bowel and the development of complications. Strict avoidance of gluten in the diet has many important benefits, as outlined below.

- A gluten-free diet should resolve the symptoms caused by gluten ingestion and reverse the damage to the small bowel seen on histopathology.
- Maintenance of a gluten-free diet would be expected to resolve anaemia, improve growth and bone health, and protect from the development of associated malignancies.

It can be especially difficult for patients to manage both type 1 diabetes and coeliac disease. Individuals with type 1 diabetes already need to perform self-blood glucose monitoring, eat nutritious meals with assessment and regulation of the intake of carbohydrates, and co-ordinate insulin administration. They also need to account for factors that can impact on their diabetes management (such as

2. Examples of gluten-free food equivalent to one carbohydrate exchange

- 1 slice gluten-free bread
- 1/3 cup of rice
- 1/3 cup of gluten-free pasta
- 3/4 cup lentils
- 3/4 cup rice porridge
- 3/4 cup corn flakes

alcohol intake and exercise) as well as manage activities that can be affected by hypoglycaemia (such as driving and employment). Added to this, the patient with co-existing coeliac disease will need to ensure on a daily basis that they have access to gluten-free meals and snacks as well as readily available gluten-free short-acting carbohydrate foods for treatment of any hypoglycaemic episodes. They will need to develop an astute knowledge of foods, beverages, medications and nutritional supplements that contain gluten, and be vigilant to check food and product labels, as gluten can often be present in a form that is not immediately obvious. This can be particularly difficult when travelling or eating away from home at restaurants, cafes or fast food venues where it is not an option to just 'skip' the carbohydrates. Additional forward planning and enquiries are often needed to determine if there are gluten-free options available.

Dealing with two chronic conditions that require lifelong attention can be especially difficult for adolescents, who may feel the impact on their independence and peer relationships.[8] Eating out with their peers can be challenging as most commercial and 'fast foods' that are gluten-free have a high glycaemic index. Individuals with few or no symptoms of coeliac disease may find it particularly difficult adhering to the gluten-free diet and will need additional education and support, including input from an Accredited Practising Dietitian (Box 1).[8] On the positive side, the range and quality of gluten-free foods that are available has increased and the awareness of gluten-free foods within the community does seem to be improving.

Benefits of diagnosing and treating coeliac disease in type 1 diabetes

Several studies have shown a higher risk of hypoglycaemic episodes, including severe hypoglycaemia, and a decreased insulin requirement in patients with type 1 diabetes and untreated coeliac disease.[9-11] It is thought that erratic and poor absorption of nutrients in untreated coeliac disease leads to the increase in hypoglycaemia. Therefore, if a person who has type 1 diabetes but is not known to have coeliac disease has unstable blood glucose levels then coeliac disease needs to be investigated. Commencement of a gluten-free diet ameliorates the increased risk of hypoglycaemia. An increase in insulin requirement may occur following commencement of a gluten-free diet.

Evidence is limited but a possible renoprotective effect of a gluten-free diet in patients with type 1 diabetes has been reported.[12,13] Also, it has been postulated that having undiagnosed and untreated coeliac disease may predispose to type 1 diabetes itself or other autoimmune conditions such as autoimmune thyroid disease.[8] There is, however, no current evidence that indicates that a gluten-free diet will prevent or change the natural history of these other autoimmune conditions.

Gluten-free diet carbohydrate options and glycaemic index

Individuals with type 1 diabetes can prevent hyperglycaemia by ensuring that the quantity of carbohydrate consumed is consistent with the insulin dose that is taken with the meal. When a gluten-free diet is required, hyperglycaemia can continue to be prevented in this manner. The challenge of choosing not only the right type of carbohydrate but also the right amount can be made manageable with the gluten-free carbohydrate lists that are included in the booklet, *Living with Diabetes and Coeliac Disease,* which is available from the Australian Diabetes Council (see Box 1). One carbohydrate exchange contains 15 g of carbohydrate. Some examples of gluten-free carbohydrate exchanges are listed in Box 2.

The glycaemic index of the foods consumed needs to be considered

Table. An example of gluten-free adjustments to daily diet

Meal	Intake prior to diagnosis	Gluten-free adjustments
Breakfast	3 Weetbix and milk	Replace Weetbix with gluten-free cereal Milk may continue
Snack	Fruit	All fruit is gluten free
Lunch	4 slices of bread with protein and salad filling	Replace bread with gluten-free bread Protein and salad may continue Spreads and condiments need to be checked to ensure absence of gluten
Snack	Yoghurt	Replace yoghurt with gluten-free yoghurt
Dinner	Spaghetti bolognaise	Replace spaghetti with gluten-free spaghetti Sauces and stock used in preparation of bolognaise need to be checked to ensure absence of gluten
Snack	Fruit salad and ice cream	Fruit may continue Replace ice cream with gluten-free ice cream

as a cause of hyperglycaemia as well as the quantity of carbohydrate eaten. A review of the studies of low glycaemic index diets in patients with type 1 diabetes concluded that a low glycaemic index diet results in improved glycaemic control with lower glycosylated haemoglobin (HbA_{1c}) levels, less hyperglycaemia and even fewer hypoglycaemic episodes.[14,15] It is recommended that patients with type 1 diabetes be educated about the use of a low glycaemic index diet in conjunction with quantification or regulation of their carbohydrate intake.[16] Some studies have shown that gluten-free carbohydrate-containing foods tend to have a higher glycaemic index than their gluten-containing counterparts, although this is not a consistent finding.[8,17] Despite this, the impact of a gluten-free diet on patients' HbA_{1c} levels appears to be generally neutral.[18] Also, these days, low glycaemic index gluten-free foods, both natural and manufactured, are usually readily available.

There is not yet adequate evidence to support the inclusion of oats in a gluten-free diet, and oats are not defined or recognised as gluten free by Food Standards Australia and New Zealand. However, it is thought that not all individuals with coeliac disease will react to uncontaminated oats in small quantities. If an individual is considering including uncontaminated oats in his or her diet, it would be worthwhile obtaining specialist advice as close follow up, including biopsy, may be required to determine its safety.

An example of an individual's daily intake of gluten-containing foods before diagnosis of coeliac disease and then gluten-free alternatives following diagnosis is given in the Table.

Education and guidance from an Accredited Practising Dietitian experienced in both type 1 diabetes and coeliac disease is crucial to help navigate the dietary requirements of these two conditions.

Screening for coeliac disease in type 1 diabetes

Routine screening for coeliac disease is recommended in all people newly diagnosed with type 1 diabetes. This can be justified given these individuals often have no or only subtle symptoms of coeliac disease, coeliac disease is many times more prevalent in people with type 1 diabetes, and diagnosis provides the opportunity to relieve symptoms and treat and prevent the complications of coeliac disease. If the initial screening is negative, the Australian national evidence-based clinical care guidelines for type 1 diabetes recommend follow-up screening for children and adolescents at least once in the following five years.[16] It has been shown that a significant proportion of children and adolescents with coeliac disease are diagnosed in subsequent years despite initial negative screening.[19-21] For adults with type 1 diabetes, the national guidelines recommend screening at diagnosis or if screening has not previously been undertaken.[16]

Conclusion

Coeliac disease is more common in people with type 1 diabetes and it is essential that it is diagnosed and treated. Strict adherence to a gluten-free diet allows resolution of symptoms and the investigation, treatment and prevention of complications. Having both diseases can pose many difficult challenges for patients. As well as diabetes self-management, these individuals will need to ensure meals, snacks and short-acting carbohydrates for treatment of any hypoglycaemic episodes are all gluten free. Ample education and support is vital, including from an Accredited Practising Dietitian experienced in both type 1 diabetes and coeliac disease. **ET**

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