

Invited Commentary

How healthy is a gluten-free diet?

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A diet that excludes the gliadin and glutenin protein fractions in wheat, rye and barley is the only treatment available for individuals with coeliac disease. There is, however, a growing enthusiasm for a gluten-free diet (GFD) or wheat avoidance in those without formally-diagnosed coeliac disease for its perceived benefit on health, weight loss, treating disease and/or minimising future risk of disease. In Australia, for example, a recent large and detailed survey of over 1000 adults indicated that almost 11 % had chosen to avoid wheat, nearly half of those being gluten-free (GF), despite a prevalence of those diagnosed with coeliac disease being much <1 %⁽¹⁾. About four out of five of those did it to help relieve symptoms such as bloating or abdominal pain. This contrasts with marketing information from USA, which suggests that most of the 30 % of the population who were considering being GF did so for 'good health'⁽²⁾. In a UK survey, 42 % of a cohort of patients with irritable bowel syndrome (IBS) believed they had gluten sensitivity, 15 % had tried a GFD and 12 % were still following it⁽³⁾. With such a high proportion of the population following a restrictive diet, it is imperative that the nutritional adequacy of the diet in general and of the available GF processed foods specifically is well understood. There has been an unwritten assumption that GF alternatives are healthier than their gluten-containing counterparts. This premise may lead to overconsumption of processed/packaged GF products including staple items (such as bread, cereals and pasta) and/or so-called energy-rich and nutrient-poor 'discretionary' items (such as cereal bars, biscuits and potato crisps), a scenario that appears to have been exploited by some marketers and food manufacturers. Likewise, it is often stated that GF processed and packaged foods are less healthy than their gluten-containing counterparts due to relatively higher content of fat, sugar and salt⁽⁴⁾. Contemporary data on this issue are scarce, underlining the importance of the supermarket evaluation of GF foods published by Wu *et al.*⁽⁵⁾.

This Australian study was a comprehensive comparison of the nutritional quality of GF *v.* matched non-GF products. An impressive total of 3213 food products were assessed across ten food categories, and included staple and discretionary products. The primary outcome of the analysis was the difference in health star rating – a new front-of-pack labelling system being introduced in Australia. It rates products between 0.5 and 5 stars in increasing 0.5 star increments, with a higher star rating indicating better nutritional quality. This rating system is based on an algorithm incorporating energy, SFA, total sugar, protein,

fibre and Na contents of the product. Overall, for GF staple items (pasta, bread and ready-to-eat breakfast cereals), there was no difference in mean rating for each group compared with the corresponding gluten-containing category, except for GF pasta, which scored 0.5 stars lower. On secondary analysis, the protein content of each of the three staple groups was lower in GF *v.* gluten-containing groups. Given the small protein contribution of grains to the overall diet, this can be considered as a negligible finding. No other differences were found between staple food groups for total energy, Na, SFA and total sugars. There were some differences in fibre content between staple groups, but dietary fibre content was not available for all products. Of importance, GF products were not consistently lower in fibre content. GF discretionary items were largely not different in star rating from their corresponding gluten-containing products, but, in fact, were rated more highly for three discretionary food groups, ice cream, maize and potato crisps and sugar-based confectioneries, largely driven by a lower mean content of SFA or total sugar.

In summary, this analysis indicated that Australian GF products are not significantly different in their nutritional quality compared with their gluten-containing counterparts. This dispels the widely stated idea that GF processed foods are in general higher in fat, salt and sugar – a finding that could be interpreted as a positive outcome for many individuals with coeliac disease who regularly rely on these products. Perhaps the more important corollary of this, however, was that no nutritional advantage was demonstrated for GF foods. In other words, the notion that GF labelling might infer a health benefit is not warranted.

There were certain limitations of this analysis, some of which the authors acknowledge. First, these data are based on nutrition information from the food label, rather than on the gold standard composition analysis of the food, which also prevented systematic assessment of certain important micronutrients that are often fortified in gluten-containing staple items (such as folate and Fe), and are important contributors to dietary intake (particularly fibre), but were not available on the label. Second, the primary outcome of this study was a comparison using the healthy star rating, which is not generalisable worldwide, although it is based on sound criteria. Third, only Australian-sourced products were included. Fourth, this analysis grouped foods into core food groups and analysed the nutrient content for each core group. Like-for-like analysis between foods – for example, GF *v.* gluten-containing white

bread – would have led to a more precise comparison, but may have limited the number of food comparisons given the much lower availability of GF products. Furthermore, only products labelled as GF were included in the analysis, not products that are GF on inspection of ingredients, although it might be argued that those foods are not a significant contributors to total nutrient intake. Finally, these data compare individual food product categories and not overall GF dietary pattern. It is important that these data are taken as they are, and that speculation regarding whether the GFD is nutritionally complete in all populations who attempt it be avoided.

The broader issue is why GFD has gained such wide support. Advocates of the GFD generally base their enthusiasm on the idea that gluten is the cause of a variety of both gastrointestinal and non-gastrointestinal conditions. A vigorous and ongoing debate in the lay press has ensued between enthusiasts and sceptics. Furthermore, the issue of so-called ‘non-coeliac gluten sensitivity’ has been the subject of several recent expert reviews^(4,6–8). The often inaccurate attribution of symptoms to gluten ingestion is a real issue^(4,7,9). Intensification of public interest has been facilitated by several factors that include the zeal of celebrity and ‘wellness’ experts for the removal of major food groups (such as grains and dairy), often supported by pseudoscience or devoid of an evidence-based rationale⁽¹⁰⁾, the plentiful supply of free but often misguided web-based dietary information and the increasing availability of GF food products and supply of GF meals in restaurants. Extreme dietary changes are often undertaken without professional advice.

Whether or not a GFD is, or ever will be, an acceptable evidence-based treatment for IBS and other conditions purported to be associated with sensitivity to gluten, it is likely that a subset of the population will continue to choose to restrict gluten potentially for the long term for a number of reasons. This raises several risks and disadvantages that become very important if the necessity for being GF is absent and are further magnified if one claimed that the benefit of the GFD is its positive effect on health. These risks are seldom raised by the GF zealots, and include the following:

- *Impaired dietary palatability*: Removal of gluten alters the texture of baked goods, leading to reduced elasticity and drier consistency compared with gluten-containing equivalents. Palatability of such foods is consequently poor⁽¹¹⁾.
- *Monetary cost*: The GFD overall may be more expensive than a gluten-containing diet, with GF alternatives reported to be up to five times more costly than standard gluten-containing products^(12,13).
- *Social consequences*: Following any exclusion diet inevitably leads to social consequences such as difficulties when eating out or in the homes of friends. Arguably, these social outcomes could feed the notion held by some that the diet is purely a fad and not a treatment for real disease.
- *Risk of an eating disorder*: Exclusion diets may lead to, or could indeed be the result of, psychosocial issues. Orthorexia nervosa is a newly described phenomenon characterised by a fixation on healthy, natural and clean eating such that social and psychological health is compromised⁽¹⁴⁾. Furthermore, patients at risk of eating disorders can use supposed food intolerances to enable gaining control over their intake without being questioned⁽¹⁵⁾.
- *Interference with appropriate medical care*: Following strict diets might impair adequate and timely medical diagnosis or intervention. For a GFD, the most frequent issue is its interference with adequate diagnosis or exclusion of coeliac disease as diagnostic testing (serology and histopathology of the small intestine) depends upon current exposure to gluten. Self-prescribed GFD for symptoms that the patient believes are gluten-related might delay attending the medical practitioner for proper assessment, investigation, diagnosis and therapy of non-gluten-related problems such as inflammatory bowel disease or colorectal cancer. Likewise, healthcare professionals need to be more vigilant in their assessment of patients who may duly benefit from a GFD, and be more tentative in advocating experimentation with restrictive diets, particularly in IBS where somatisation⁽¹⁶⁾ and preoccupation and fear of food are identified⁽¹⁷⁾.
- *Nutritional inadequacy*: Exclusion diets of any nature may put individuals at risk of nutritional deficiency. The effects of GFD on nutritional intake are complex. On the one hand, higher risk of nutritional deficiency may be due to insufficient inclusion of suitable alternatives. This risk is likely to increase if not adequately supervised by suitably qualified healthcare professionals and underlines the importance of specialist dietetic input for conditions where these diets are integral (e.g. coeliac disease, allergy), or at least valuable (e.g. IBS). One potential adverse nutritional outcome in these individuals is reduced intake or complete exclusion of grains, leading to reduction in the intake of dietary fibre, B-group vitamins and Se. Indeed, cohort studies in coeliac patients report compromised intake of fibre and several micronutrients including Ca, Fe, Zn and folate^(18,19). Furthermore, there is growing evidence for the association between increased cereal fibre intake and a reduced incidence of chronic diseases such as type 2 diabetes⁽²⁰⁾ and CHD⁽²¹⁾, and most public health recommendations internationally endorse whole grains as an important part of a healthy dietary pattern. On the other hand, some individuals who choose to follow a GFD may, in fact, improve the nutritional quality of their diet by reducing intake of processed foods and increasing the intake of whole foods that are naturally GF such as fruits, vegetables and GF grains, thereby improving the nutrient density of the diet. Thus, the proposed weight-loss benefits of a GFD⁽²²⁾ may in fact be mistakenly attributed to gluten avoidance rather than to better food choice and reduced overall energy intake, although this has not been confirmed in intervention studies. In addition, the proposed benefit of increased energy levels and/or well-being on a GFD may relate more to the overall increase in non-processed, whole foods and improved nutritional quality of the diet rather than to the elimination of gluten *per se*.

The work of Wu *et al.*⁽⁵⁾ helps dispel some nutritional myths both for and against the GFD – there is no clear nutritional advantage or disadvantage in choosing equivalent GF products. The cost difference is substantial, but this aspect was

unfortunately not addressed, as it would have put GF foods into proper perspective both for those who need it and for those who do not. However, the core issue of concern to public health is whether the majority of people without coeliac disease who follow a GFD need to do so. The bulk of evidence would suggest that the majority do not^(4,6–8). The long list of risks outlined above associated with embarking on restrictive diets – including nutritional adequacy when the overall dietary pattern and food choices are considered – raises alarms when most dietary approaches and indications are based more on pseudoscience and celebrity endorsement than on sensible and rational science, and are being implemented without professional supervision. Caution by the community and by healthcare professionals should be paramount in the consideration of commencing such restrictive diets.

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