

## Review Article

## A Gluten Free Diet Is Not an Appropriate Choice without Diagnosis

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**Abstract:** In the past, only people diagnosed with celiac disease, approximately 1% of the population, avoided gluten consumption through all their meals. However, popular media often now mistakenly present gluten-free foods as being a healthier choice, and more people have now concluded that gluten is a harmful part of the diet. A review of literature on gluten-free diets, gluten sensitivity, celiac disease, and attitudes toward gluten consumption was undertaken to examine the prevalence and consequences of adopting a gluten-free diet and to provide guidance to healthcare practitioners whose patients are now often adopting this diet without medical input. Aside from celiac disease, nonceliac gluten sensitivity (NCGS) occurs in those persons in which gluten ingestion leads to symptomatic manifestations in the absence of celiac disease or wheat allergy but who report a remission of certain symptoms after removing gluten from their diet. However, it was been shown that a large percentage of people who claim NCGS do not feel those manifestations under a double-blind challenge to gluten. Moreover, some parents, believing that ingesting gluten is detrimental for their health, adopt gluten-free diets for their children. A review of existing data shows that there are detrimental effects to going gluten free, including loss of the dietary fiber, deficiencies in dietary minerals and vitamins, and potential heavy metal exposure. Healthcare practitioners should query patients about their dietary choices, and in cases of questionable adoption of gluten-free diet, patients and parents are educated about the detriments of a gluten-free diet, and in cases where patients continue to insist on gluten-free foods, referrals to nutritional counseling are warranted in order to minimize potential harm

**Keywords:** celiac disease, harmful part of the diet, nonceliac gluten sensitivity.

### INTRODUCTION

Gluten is a high-molecular-weight seed storage protein commonly found in grass-related grains, such as wheat, barley, and rye. The natural role of these seed storage proteins is to nourish seeds during flowering and germination, thereby contributing to the successful reproduction of the species (Shewry, P. R. *et al.*, 1995). Gluten is a composite protein, composed of glutenin and prolamins, and is also responsible for the ability of wheat to form dough (Field, J. M. *et al.*, 1983). Hence, gluten is an integral component of an incredible variety of wheat-containing foods, including breads, cereals, and pastas.

### Gluten-Related Disorders: Celiac Disease VERSUS Nonceliac Gluten Sensitivity

Celiac disease (CD) affects approximately 1% of the population (Fasano, A. *et al.*, 2003; Mäki, M. *et al.*, 2003; Dubé, C. *et al.*, 2005) and is an immune-

mediated enteropathy most commonly associated with the human serotype HLA DQ2 or DQ8, with demonstration of small intestinal villous atrophy and autoantibodies (antitissue transglutaminase and antiendomysal) (Sanders, D. S. *et al.*, 2001). When people with CD ingest gluten, an inflammatory process that targets the intestinal mucosa is triggered, resulting in immune-mediated enteropathy with symptoms that may classically include malabsorption, diarrhea, steatorrhea, weight loss, or growth failure (Sanders, D. S. *et al.*, 2001). Studies have also suggested that some CD patients may not suffer from the classical gastrointestinal symptoms, but alternatively present with iron deficiency anemia (Corazza, G. R. *et al.*, 1995), osteoporosis (Kempainen, T. *et al.*, 1999), ataxia or peripheral neuropathy (Hadjivassiliou, M. *et al.*, 1996) or symptoms that resemble IBD (Ludvigsson, J. F. *et al.*, 2013). Nonceliac gluten sensitivity (NCGS) occurs in those persons in which gluten ingestion leads to symptomatic manifestations in the absence of celiac

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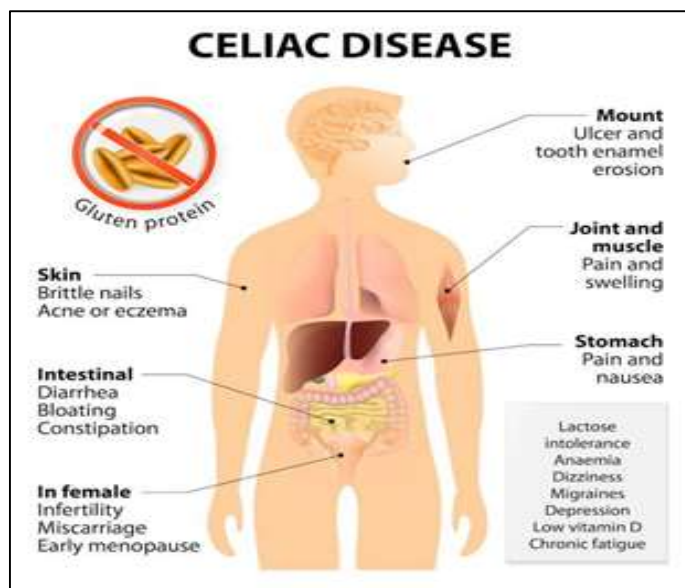
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disease or wheat allergy (WA) but who report a remission of certain symptoms after removing gluten from their diet (Biesiekierski, J. R. *et al.*, 2011; Zingone, F. *et al.*, 2017). Symptoms are related to the gastrointestinal track (abdominal pain, bloating, constipation, and diarrhea) or extraintestinal (fatigue, headache, joint and muscle pains, depression, and “foggy mind”) (Catassi, C. 2015; Francavilla, R. *et al.*, 2014). Despite the name, it is not clear in many cases of NCGS whether the symptoms are caused by gluten itself or by other components of the grains that are consumed (Carroccio, A. *et al.*, 2014). The Salerno Expert’s Criteria provide guidance on how to test someone for NCGS. It is based on symptoms but follows a single- or double-blind placebo-controlled challenge . A key element of these criteria is that the gluten and gluten-free preparations must be indistinguishable to the patient, which is difficult to achieve since gluten-free foods are typically detected easily due to differences in flavor and/or texture. Lioneti *et al.*, (2014) found that the prevalence of NCGS after gluten rechallenge is decreased when the Salerno Expert’s Criteria are applied. Their studies

found that a high proportion of patients suspected to have a NCGS did not have symptoms in response to gluten ingestion when they were not able to distinguish between foods with or without gluten.

**Nutritional Risks**

GFD can lead to nutritional deficiencies of macronutrients and micronutrients. Gluten-free foods, when compared to equivalent wheat-based foods, show deficiencies in minerals, including calcium, iron, magnesium, and zinc, and in vitamins, including vitamin B12, folate, and vitamin D, as well as significantly reduced fiber (Tanpowpong, P. *et al.*, 2014; NPD Group. 2015). A 2013 study of both recently diagnosed and long-term celiac patients adhering to a GFD found nutritional deficiencies of each of these nutrients in both populations and recommended dietary education for celiac patients to help alleviate the problem (Tanpowpong, P. *et al.*, 2014; Christoph, M. J. *et al.*, 2018). In addition, as nonwheat substitutes in a GFD often contain little fiber, adherents of a GFD are at increased risk for constipation.



**DANGERS OF GLUTEN FREE DIET**

**Benefits of a Gluten-Free Diet**

For patients diagnosed with CD, a gluten-free diet is the only treatment. Ingestion of gluten in these genetically predisposed individuals results in a T-cell-mediated immune reaction, leading to villous atrophy and clinical symptoms. Avoiding gluten prevents this response, and as such, for CD patients, a gluten-free diet is critical to their well-being. For sufferers of CD, the increase in popularity of a GFD among the general population has led to dramatically more selections of foods devoid of gluten, which are likely, more palatable and more likely to be enriched with vitamins and minerals to meet the demands of an expanded marketplace. Also, more studies are aimed at finding those food sources that are still gluten free but higher in

nutrients missing in a GFD. For individuals who do not suffer from CD, benefits of a GFD are less obvious. The positive outcomes of a nocebo/placebo effect for those with NCGS, even if it is not the gluten component of wheat that leads to their symptoms, cannot be discounted. For some individuals, this may justify the detriments of a GFD.

**High Cost and Inconvenience:**

Numerous studies have demonstrated that adherence to a GFD significantly increases the cost of food for adherents, with prices 2 to 3 times greater than for similar nongluten-free products (Aziz, I. *et al.*, 2014; Fasano, A. *et al.*, 2003). Over 15.5 billion US dollars were spent on sales of gluten-free foods in 2016,

double the amount spent in 2011, indicating that the popularity of a GFD continues to grow (Food Allergen Labeling and Consumer Protection Act of. 2004; Aziz, I. *et al.*, 2014). In addition to cost, adherents of a GFD have inherently fewer choices in foods and may have difficulty finding or complying with a GFD (Tanpowpong, P. *et al.*, 2012). Despite the significant cost and added inconvenience, healthy individuals that do not have CD or symptoms after ingesting gluten are increasingly willing to pay extra money for GF foods due to misplaced beliefs that those foods will make them healthier and feel better. GFD can lead to nutritional deficiencies of macronutrients and micronutrients. Gluten-free foods, when compared to equivalent wheat-based foods, show deficiencies in minerals, including calcium, iron, magnesium, and zinc, and in vitamins, including vitamin B12, folate, and vitamin D, as well as significantly reduced fiber (Tanpowpong, P. *et al.*, 2012; NPD Group. 2015). A 2013 study of both recently diagnosed and long-term celiac patients adhering to a GFD found nutritional deficiencies of each of these nutrients in both populations and recommended dietary education for celiac patients to help alleviate the problem (Tanpowpong, P. *et al.*, 2012; Christoph, M. J. *et al.*, 2018). In addition, as nonwheat substitutes in a GFD often contain little fiber, adherents of a GFD are at increased risk for constipation. Notably, some food components known to be detrimental to health are higher in the GFD than in a regular diet. For example, a GFD increases dietary exposure to arsenic (Tanpowpong, P. *et al.*, 2012; Shewry, P. R. *et al.*, 1995). and the meals tend to have a higher content of hydrogenated and saturated fatty acids and a higher glycemic index (Tanpowpong, P. *et al.*, 2012; Food Allergen Labeling and Consumer Protection Act of. 2004). In general, it has been shown that a GFD is an unhealthier diet choice than a regular diet for those that do not have CD.

### 7. Benefits of a Gluten-Free Diet

For patients diagnosed with CD, a gluten-free diet is the only treatment. Ingestion of gluten in these genetically predisposed individuals results in a T-cell-mediated immune reaction, leading to villous atrophy and clinical symptoms. Avoiding gluten prevents this response, and as such, for CD patients, a gluten-free diet is critical to their well-being. For sufferers of CD, the increase in popularity of a GFD among the general population has led to dramatically more selections of foods devoid of gluten, which are likely, more palatable and more likely to be enriched with vitamins and minerals to meet the demands of an expanded marketplace. Also, more studies are aimed at finding those food sources that are still gluten free but higher in nutrients missing in a GFD. For individuals who do not suffer from CD, benefits of a GFD are less obvious. -e positive outcomes of a nocebo/ placebo effect for those with NCGS, even if it is not the gluten component of wheat that leads to their symptoms, cannot be

discounted. For some individuals, this may justify the detriments of a GFD. -e benefits of GFD continue to have an increased interest among researchers and practitioners working on the improvement of behavior in children with autism and other spectrum disorders. Even though some research informed that there was not significant evidence of improvement of functioning in children with autism, GFD was reported as well tolerated and safe (Tanpowpong, P. *et al.*, 2012; Field, J. M. *et al.*, 1983). Lee *et al.*, (Tanpowpong, P. *et al.*, 2012; Fasano, A. *et al.*, 2003). reported that modified gluten-free ketogenic diet with supplemental medium-chain triglycerides (MCT) has a positive treatment effect on the improvement of behavior in children with autism spectrum disorder and requires fu.

### CONCLUSION

While celiac disease patients must permanently remove gluten from their diet, the literature suggests that many individuals who claim to suffer from NCGS may in fact have no actual sensitivity to gluten although it is possible they are sensitive to other components of wheat. Alternatively, these individuals may be benefitting from a nocebo/placebo effect when it comes to adopting a GFD. It is likely, however, that the majority of persons adopting a GFD have no medical basis for doing so. The choice to adopt a GFD is often made by individuals without medical input, in the belief that they are adopting a healthier diet. Unfortunately, choosing GFD, irrespective of whether it is medically indicated, generally entails increased food costs, a decrease in fiber consumption, potential decreases in mineral and vitamin consumption, including calcium, magnesium, zinc, vitamin B12, folate, and vitamin D, and potentially increased exposure to dietary hydrogenated and saturated fatty acids, and arsenic. Clearly, adopting a GFD does not come without risk. In the end, only persons with CD, WA, or confirmed NCGS should follow a GFD, and they should do so under medical supervision. For individuals who insist on a GFD in the absence of a diagnosis that suggests its benefits outweighs its risks, nutritional counseling is recommended to ensure that these individuals can minimize the risks to themselves while still choosing the diet they prefer. While celiac disease patients must permanently remove gluten from their diet, the literature suggests that many individuals who claim to suffer from NCGS may in fact have no actual sensitivity to gluten although it is possible they are sensitive to other components of wheat. Alternatively, these individuals may be benefitting from a nocebo/placebo effect when it comes to adopting a GFD. It is likely, however, that the majority of persons adopting a GFD have no medical basis for doing so. -e choice to adopt a GFD is often made by individuals without medical input, in the belief that they are adopting a healthier diet. Unfortunately, choosing GFD, irrespective of whether it is medically indicated, generally entails increased food costs, a decrease in

fiber consumption, potential decreases in mineral and vitamin consumption, including calcium, magnesium, zinc, vitamin B12, folate, and vitamin D, and potentially increased exposure to dietary hydrogenated and saturated fatty acids, and arsenic. Clearly, adopting a GFD does not come without risk. In the end, only persons with CD, WA, or confirmed NCGS should follow a GFD, and they should do so under medical supervision. For individuals who insist on a GFD in the absence of a diagnosis that suggests its benefits outweighs its risks, nutritional counseling is recommended to ensure that these individuals can minimize the risks to themselves while still choosing the diet they prefer. Conflicts of Interest -e authors declare that there are no conflicts of interest regarding the publication of this paper.

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