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## Is Gluten-Free Diet a Good Advice for Healthy Individuals?

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**Abstract** The gluten proteins are the storage proteins of wheat that are responsible for cohesive and viscoelastic properties of dough, withhold gas during fermentation and to set of dough during baking. Gluten also finds place in pet foods and sausage-type products besides bakery. On the health point of view, gluten consumption may cause negative effect for some people who have suffering celiac disease, wheat allergy and non-celiac gluten sensitivity. In some medical journals, media tools and medical doctors also assert that gluten is responsible risk of obesity, neuropsychiatric symptoms, cardiovascular risk and metabolic syndrome for healthy people. Even, it is claimed that consumption of gluten-containing foods such as bread is a danger on health for every person. Due to the many claims like these, gluten-free diet became more popular among people. On the contrary, there are also many claims which do not support consumption of gluten-free diet for healthy people. Some researchers indicated that gluten restriction is not beneficial on heart health for people without celiac disease. Gluten-free diet reduces consumption of whole grains which are known beneficial for heart health. It may indirectly increase the risk of heart disease and type-2 diabetes. So, gluten plays important roles both in human health and food industry. It can be concluded that except for people suffering from gluten, people need not to eliminate gluten from their diet.

**Keywords** Gluten, Gluten- free diet, Gluten and health

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### Introduction

Gluten is composed from two main groups of proteins; glutenin and gliadin. This protein plays important roles in water absorption capacity, cohesivity, viscosity and elasticity of dough [1]. It is also responsible to produce good quality bread [2]. Besides, gluten may cause celiac disease (CD), wheat allergy (WA) and non-celiac gluten sensitivity (NCGS) at some people [3]. On the other hand, there are some claims supporting the healthy people for consuming the gluten-free diet. So gluten can be harmful for people who have gluten disorders. Thus, the purpose of this review is to discuss the consumption of gluten and gluten-free diet both for healthy individuals and individuals suffering from gluten related disorders

### Gluten and Its Usage

The gluten complex is composed of two main groups of proteins: gliadins (a prolamin) and glutenin (a glutelin). They differ from rheological properties, in molecular weight and size. Gliadins contribute to dough viscosity and sticky, glutenins contribute also dough elasticity [4]. It means that this protein plays an important role in water absorption capacity, cohesivity, viscosity and elasticity of dough [1]. It is also responsible to produce good quality bread [2]. In addition to these, it has been used in foods to improve texture and increase volume [5]. The gluten proteins belong to the prolamin class of seed storage proteins of wheat [6]. Prolamins are found in foods such as breads, biscuits, cakes and pastas. Baking industry uses gluten frequently. Apart from these, prolamins are found in meat, sausages, soups, hamburger buns and ready to serve foods, too. In such foods, gluten has function as a thinner, water or fat retention or used to increase the extensibility and to improve texture [7].

Gluten have abilities to bind fat and water. At the same time, it increases the protein content. These properties make gluten attractive for meat, fish, and poultry products. Gluten provides to convert less desirable fresh meats



into more favorable steak-type products. Due to provide good slicing ability, it is also used as a binder for turkey-meat pieces. Apart from this, gluten is an excellent binder in processed-meat products, poultry rolls, canned hams, and other non-specific loaf-type products and minimizes losses during cooking process. The other use of gluten is as a meat replacement in vegetarian foods. It is used to produce the artificial forms of expensive foods such as seafood and crab. Due to the health and food safety, some people do not want to consume meat and its products. This situation increased the demand for meatless alternatives. For flavouring, shaping and cooking, pure wet wheat gluten can be added into meatball and steaks [8].

### Gluten and Health

Gluten is responsible for celiac disease, wheat allergy and non-celiac gluten sensitivity at some people [3]. Celiac disease is seen in 1% of the population in Europe and The United States. This disease damage to the small intestine and decreased absorption such as iron, calcium, vitamins A, D, E, K and folate [9]. Celiac disease includes many gastrointestinal symptoms. These symptoms are diarrhea, steatorrhea, weight loss, bloating, flatulence, abdominal pain. Apart from these, there are also non-gastrointestinal abnormalities such as anemia, bone disease and skin disorders. The only treatment for celiac disease is a gluten-free diet [10]. But a gluten-free diet might not be easy. Because solution is not only avoiding consumption of gluten-containing grains [11]. Most of the foods such as breads, biscuits, pasta, cakes are made up of wheat. Because of these reasons, it has increased in demand of gluten-free products [9].

A wheat allergy is not such as celiac disease. It is a food allergy and immune system reacts extremely versus a specific food protein. When this protein is consumed, it can be seen an allergic reaction such as rashes, hives, itching, swelling, trouble breathing, wheezing, loss of consciousness [12]. Wheat allergy is also an occupational asthma (baker's asthma) and rhinitis. This situation is responsible to breathe of wheat flours and affects to 10-15% of bakers, millers and pastry factory workers. Symptoms are not usually occurred after the ingestion of cooked wheat. They can develop after consumption of foods contaminated by wheat flour [13].

Until today it has been believed that gluten intolerance has been defined as celiac disease and wheat allergy. But several study results have been shown that gluten can also affect people who do not have celiac disease or wheat allergy. This syndrome has been defined as gluten sensitivity (GS) or non-celiac gluten sensitivity and included in the list of gluten disorders in 2012. It has been believed that NCGS is the most common disorder of gluten intolerance on the studies [14]. Gluten is also responsible with non-celiac gluten sensitivity. NCGS is a relatively more prevalent than CD [15]. These disease symptoms are intestinal and extra-intestinal symptoms. NCGS can show symptoms such as tiredness, headache, fibromyalgia-like joint or muscle pain, leg or arm numbness, dermatitis or skin rash, depression, anxiety, and anaemia. The symptoms are seen shortly after gluten consumption and disappearing within hours or a few days. It is shown in Table 1 [16].

**Table 1:** Gluten related disorders [16]

Gluten-related disorders	Key symptoms	Diagnosis
Celiac disease	Malabsorption: diarrhoea, abdominal pain, bloating	*HLA genotyping: HLA-DQ2 or HLA-DQ8 positive
Wheat allergy	Itching and swelling in the nose and throat, rash, wheezing	*IgE measurements
IBS	Bloating, abdominal pain, diarrhoea, wind, altered bowel habits	Functional symptoms that cannot be explained by any other physiological, biochemical or inflammatory cause
NCGS	IBS-like symptoms Fatigue, headache, fibromyalgia-like joint or muscle pain Leg or arm numbness, foggy mind, skin rash, anemia Depression, anxiety	Different steps needed: Definitive exclusion of coeliac disease Exclusion of other dietary triggers  Dietary gluten exclusion and rechallenge

\*HLA: Human leukocyte antigen, IgE: Immunoglobulin E



Gluten may promote inflammation in the absence of celiac disease or non-celiac gluten sensitivity. Because of these, some ideas have arisen in the medical community and public that gluten might increase the risk of obesity, metabolic syndrome, neuropsychiatric symptoms, and cardiovascular risk among healthy people. So gluten-free diets have gained popularity [17].

But, some concerns exist about a gluten-free or gluten restricted diet in terms of nutritionally [18]. In a research, the consumption of gluten is not significantly linked with risk of heart disease. On the contrary, avoiding of gluten may cause in smaller amounts intake of whole grains that they have a negative impact on the cardiovascular diseases [17]. It is also so clear that most whole grains are sources of B vitamins, iron, zinc, and magnesium and fiber [19].

The researchers state that people without gluten disorders should not be avoided gluten on the diets. In recent years, a lot of people who without gluten disorders have begun to consume more than of gluten-free foods because they think that gluten can be harmful on their health. However, any of studies have shown relation between risk of chronic conditions with gluten intake in people without gluten disorders [20].

The gluten-free diet became more popular for weight loss and improved performance by celebrities and athletes. Between 2004 and 2011, it is shown that the market of gluten-free foods grew up rate of 28%. It has been alleged that the gluten-free diet assist in weight loss. For some people, this can be a desirable situation. But gluten-free diet may get worse, people who are overweight or obesity [21].

In a study on whole grains including wheat, groups eating 2-3 servings daily compared with groups eating amounts less than 2 servings daily were detected to have dramatically lower rates of heart disease and risk of type-2 diabetes [22]. Gluten may be evaluated also as a prebiotic which is feeding the helpful bacteria in human bodies. Arabinoxylan oligosaccharide which is a prebiotic carbohydrate is found on wheat bran and has been indicated that promote the activity of bifidobacteria in the colon. Activity of these bacteria is affected gastrointestinal diseases including inflammatory bowel disease, colorectal cancer, and irritable bowel syndrome [23]. When gluten-free foods have been compared with gluten containing foods, it has been seen that gluten-free foods have more saturated fat, more sodium and less fiber and protein as far as gluten-containing foods. It is shown in Table 2 [24].

**Table 2:** Nutritional profile of gluten-free and non-gluten free products categories [25]

Products types	Nutrient content(per 100g)		Energy (kJ)		Na (mg)		Saturated fat (g)		Protein (g)		Total sugars (g)	
	n	Percentage of all products	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<b>Cereal bars</b>	237											
<b>GF</b>	60	25.3	1907	299	53.9	52.3	5.3	4.6	9.7	3.8	30.6	10.4
<b>Non-GF</b>	177	74.7	1765	224	105	105	6.0	4.0	8.1	3.4	25.9	7.5
<b>Cakes</b>	491											
<b>mixes/cakes</b>	59	12.0	1469	307	300	215	3.4	4.9	4.9	6.4	44.1	24.1
<b>GF</b>	432	88.0	1501	290	319	200	5.5	4.6	4.6	1.3	36.0	13.5
<b>Non-GF</b>	206											
<b>Sugar-based confectioneries</b>	45	21.8	1380	198	51.9	102	2.0	3.3	3.4	2.9	38.8	31.9
<b>GF</b>	161	78.2	1462	119	86.9	96	1.0	1.0	2.9	1.7	52.4	14.5
<b>Non-GF</b>												

Both in medical research and popular media have been started to dwell on health effects of gluten. Patient who suffering celiac disease needs a lifelong gluten-free diet. However, this condition and adverse claims about health effects of gluten is inconsistent. Nevertheless there is a popular feeling that GF foods are healthier and there has been an efficient increase in demand and consumption of GF foods in many Western countries in recent years. Foods which containing grains such as wheat, rye and barley are consumed by a great majority of



population. If people do not consume these grains due to the GF diet, their daily diet can be adversely affected [25].

In researches about effects of GF diet, it has been reported that GF products cause an inadequate macronutrient intake. Besides GF products have both saturated and hydrogenated fatty acids of large amount and cause an increase in the glycemic index and glycemic load of the food [26].

In a study at the Cleveland Clinic, it has reported that there was a two times more increase in coronary artery disease in celiac disease in comparison with other patients. In another study, when it has diagnosed of celiac disease, it has detected increasing of 60% in the ratio of cardiovascular disease risk [27].

Gluten-free products caused some problems such as technological and nutritional properties in the food industry. Gluten consuming may cause to reduced starch digestibility. In case of not being gluten, postprandial glycaemic response has increased [28]. In a study, it has been detected that GF products may affect in vivo and in vitro starch digestion. It is stated as a reason that is used different formulations for GF products [29].

### Conclusion

Although gluten plays important roles both in human health and food industry, it may cause celiac disease, wheat allergy and non-celiac gluten sensitivity at some people. It can be concluded that gluten consumption is not unhealthy, unless there is celiac disease, gluten intolerance or allergy. In fact in some cases, to not intake grains for avoiding gluten consumption may cause health problems. The people are misdirected by some journals, media tools and celebrities about the consumption of gluten. They claim that GF diet is healthier than gluten containing diet for every people and aids to weight loss. However there is no supporter evidence about these claims. As a matter of fact, sugar or fat are added for providing the gluten properties in foods which have more high calories according to gluten including ones. Besides, if people avoid to consume gluten, they may not intake enough whole grains. Most of the people get their fiber needs from whole grain products. If people give up whole grains for gluten, they have to intake too little fiber and this situation is another gluten-free diet side effect. In addition to this, getting some vitamins and minerals on a gluten-free diet may be a limited. That is to cause vitamin and mineral deficiencies, too. All of time, the media, medical research and celebrities may not be true. Taking into account all of these, the people who do not have any gluten related disorders should consume grain products containing gluten. All these show that gluten is a necessity and an important factor both technological and health wise. So, a gluten-free diet for healthy individuals does not seem to be the right advice.

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