

GLUTEN-FREE DIET IN NON-CELIAC ATHLETES - BENEFITS AND POTENTIAL HARMFUL EFFECTS

UDC 615:796:36.015

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Abstract. *The aim of this paper is to present the latest scientific data related to a gluten-free diet, the justification of the introduction of a diet, the advantages and disadvantages of this dietary approach in the population of athletes. Non-celiac gluten sensitivity, previously defined as gluten sensitivity, is a relatively new clinical entity first defined in 2011. This disorder is characterized by intestinal symptoms (abdominal pain, bloating, diarrhea, and constipation) and extra intestinal symptoms such as headache, chronic fatigue, impaired concentration or "brain fog", numbness and muscle or bone pain are frequently reported. Since most of the symptoms are subjective without accompanying clinical signs, and since no specific biomarker for diagnostics exists in clinical practice, there is always a dilemma whether this is really a health problem. A gluten-free diet has become popular among athletes due to the opinion that it has ergogenic effects. It should also be borne in mind that the introduction of a gluten-free diet has its drawbacks. Several studies suggest that a gluten-free diet is deficient in whole grains, dietary fiber, micronutrients and minerals. The data collected from the National Health and Nutrition Examination Survey study indicate the existence of higher concentrations of heavy metals in urine and blood samples taken from people following a gluten-free diet as a result of narrowed food choices. These data remind us to keep in mind the justification of the introduction of a gluten-free diet and the potential damage to health when observed adherence to this pattern of nutrition in the long run.*

Key words: *Gluten-Free Diet, Athletes, Non-Celiac Gluten Sensitivity, Effects*

Received September 01, 2020 / Accepted October 04, 2020

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INTRODUCTION

Non-celiac gluten sensitivity (NCGS), previously defined as gluten sensitivity is a relatively new clinical entity first defined in 2011, examined in more detail by a group of scientists who gave the so-called Oslo definition of this health problem (Ludvigsson et al., 2013). In 2012, at the Second Meeting of Experts in Munich, the new gluten intolerance syndrome was given the current name of non-cellular gluten sensitivity (Capili, Chang, & Anastasi, 2014).

This disorder is characterized by over a hundred symptoms. The most common are intestinal symptoms, bloating, abdominal pain and discomfort, constipation, diarrhea. Extra intestinal symptoms such as headache, chronic fatigue, impaired concentration, tingling sensation in the arms, legs and muscles, and bone pain may also occur (Biesiekierski et al., 2011; Sapone et al., 2012; Di Sabatino & Corazza, 2012). The pathophysiology of NCGS remains unclear because most studies have been conducted on patients considered solely on the basis of subjective self-assessment of the existence of disease-specific symptoms. Under these circumstances, the NCGS subjective diagnosis resulted from a nocebo response. With the existence of such limitations, some studies have examined the consequences of the intake of certain components of flour and the possible mechanism underlying the dysfunction of the gastrointestinal tract, and the onset of symptoms. There have been suggestions that gluten is not the only trigger in the onset of NCGS symptoms; other components including fermentable oligo-, di-, and mono-saccharides and polyols (FODMAPs) and amylase trypsin inhibitors (ATIs) may have the same effects. FODMAPs are parts of flour that may play a role in the formation of NCGS. The results of double-blind placebo-controlled studies show that symptoms are reduced during a diet with reduced intake of FODMAPs (Biesiekierski et al., 2013). Attention has been focused on fructans, as components of FODMAPs; studies in controlled conditions where subjects ingested gluten, fructans or placebo indicated that the highest score of reported symptoms was observed in patients after the exposure to fructans (Skodje et al., 2018). ATIs represent 4% of total proteins, but are also the main cause of bakers' asthma (Gómez et al., 1990). The results of various studies indicate that ATIs may lead to the activation of natural immunity and various immune cells and may play a role in the pathophysiological mechanism of NCGS (Junker et al., 2012; Zevallos et al., 2017).

Gluten playing the role of a trigger in the appearance of characteristic symptomatology is confirmed in various studies. Di Sabatino and associates (2015) conducted a randomized placebo-controlled study on 59 subjects with NCGS symptoms, and reported worsening of symptoms in gluten-treated patients (4.375g) as compared to placebo subjects. In a large study that followed patients with functional gastrointestinal disorders, 14% were diagnosed with NCGS and worsening (5.6 g/day) after taking gluten (Elli et al., 2016)

Studies also confirm that this disorder is not uncommon in the pediatric population, in children with functional gastrointestinal disorders. Yet, on the other hand, studies suggest that in the case of a strong nocebo effect, the NCGS defining methodology should be carefully chosen. In controlled studies, only one-third of the subjects with self-reported NCGS had a confirmed diagnosis after a double-blind gluten challenge, which suggests that most self-reported NCGS patients should by no means be labeled as NCGS. It is an interesting fact that only a third of people classified as NCGS can react and recognize gluten from flour (Zanini et al., 2016).

The diagnosis of non-celiac gluten sensitivity remains unattainable due to the limited knowledge of the pathophysiological mechanism and the lack of reliable markers (Marković, Bjelaković, Jović, Ilić, & Popović, 2019). Biomarkers are regarded as measurable indicators of normal or pathological processes, but also of the pharmacological response within a certain therapeutic procedure. Identifying a specific biomarker would be a breakthrough in the field of non-celiac gluten sensitivity in terms of improving patient access and identifying subgroups of patients who respond to a gluten-free diet. For the time being, according to the consensus of experts from a conference held in Salerno, the gold standard in diagnosing is the Double-Blind Placebo-Controlled crossover gluten challenge (Catassi et al., 2015; Francavilla et al., 2018)

The disadvantage of this diagnostic procedure is the complex protocol, which is why it is not feasible in everyday clinical practice.

The aim of this paper is to present the latest scientific data that deal with a non-celiac gluten sensitivity, gluten-free diet, justification of introducing a diet, advantages and disadvantages of this dietary approach in a population of athletes.

THEORETICAL CONSIDERATIONS OF THE PROBLEM

Potential benefits of a gluten-free diet

Over recent years, there has been a growing interest in this health disorder. Gluten-free diet has become popular among athletes. Athletes believe that this diet is healthier and has ergogenic effects (Lis, Stellingwerff, Kitic, Ahuja, & Fell, 2015a). In a global study conducted on 910 athletes, 41% of the subjects reported that they adhered to this diet. More than half of the subjects believe that a gluten-free diet improves sports performance, 74% of the subjects believe that a gluten-free diet renders body composition more suited for better performance, and a minority who were not on a gluten-free diet have the same beliefs (Lis, Stellingwerff, Shing, Ahuja, & Fell, 2015b). Some of the top athletes publicly attribute their success to this diet. Novak Đoković is one of them, a tennis player with 17 Grand Slam titles and the most ardent supporter of this diet in his book *Serve for Victory*, talks about a gluten-free diet plan to which he owes his mental and physical excellence. There are no data on the incidence of the disease, although it is estimated that between 0.5 and 13% of the general population suffers from NCGS. There are also no literature data on the prevalence of gluten sensitivity in the population of athletes. Having in mind conflicting literature data on this health issue and the benefit of a gluten-free diet on sports performance, we can ask whether gluten really affects the physical fitness of athletes. For the time being, there is only one study that monitors the effects of a gluten-free diet in athletes, a study conducted by Lis and associates (2015a), where they pointed out that a short-term gluten-free diet has no effect on sports performance and the improvement of gastrointestinal symptoms, and has no effect on reducing inflammatory markers in cyclists. Also, prescribing a gluten-free diet is not based on evidence based on medical practice and Lis and associates (2015b) suggest that in fact the acceptance of a gluten-free diet in most cases is not proven necessary, but that the diet itself is accepted based on the subjective feeling that removing gluten from the diet allows health benefits.

Although most people on a gluten-free diet say they feel better without gluten in their diet, current knowledge suggests that this result is actually possible due to the increased attention to one's diet in general, a strong placebo effect, or choosing healthier options

(e.g., using fruit instead of bread provides higher nutritional value and fewer empty calories). People on a gluten-free diet discover many healthier nutritional substitutes for gluten foods, but that does not mean that it is really necessary to completely eliminate gluten.

Disadvantages of a gluten-free diet

It should also be borne in mind that the introduction of a gluten-free diet has its drawbacks. The fact is that the introduction of this diet will inevitably lead to a change in nutritional intake (Martin, Geisel, Maresch, Krieger, & Stein, 2013). It should be noted that gluten-free foods vary significantly in nutritional composition as compared to food that contains gluten. Most gluten-free food is not fortified with iron and folic acid.

Food processors add sugar, salt and unhealthy fats during food processing. A good portion of the products contains refined gluten-free flour that lacks fiber. One of the studies suggests that a gluten-free diet, precisely because of its composition, can lead to a decrease in the number of intestinal bacteria and changes in the functioning of the immune system (De Palma, Nadal, Collado, & Sanz, 2009). Several studies suggest that a gluten-free diet is deficient in whole grains, dietary fiber, micronutrients (vitamin D, vitamin B12, folic acid) and minerals (iron, zinc, magnesium, and calcium). A higher content of both saturated and hydrogenated fatty acids in gluten-free food was determined, and an increase in the glycemic load of the meal and glycemic index (Vici, Belli, Biondi, & Polzonetti, 2016). Additionally, a gluten-free diet contains more sugar and fat, carrying risks for the development of type 2 diabetes (Zong et al., 2018). Research by Lebwohl and associates (2017) found a link between avoiding gluten intake and reduced intake of whole grains and cardiovascular health, i.e., a gluten-free diet is associated with the occurrence of coronary heart disease, thus, the promotion of a gluten-free diet in people who do not suffer from celiac disease should not be encouraged from the point of view of these researchers.

Data collected from the National Health and Nutrition Examination Survey study indicate the existence of higher concentrations of arsenic and cadmium in urine and increased concentrations of mercury, lead and cadmium in people on a gluten-free diet, which is a consequence of the increased intake of rice and fish where there are high concentrations of heavy metals (Raehsler, Choung, Marietta, & Murray, 2018). A strict gluten-free diet is associated with intestinal mucosa regeneration on the one hand, while on the other hand this diet is associated with the appearance of anxiety, insomnia and a reduced score of self-assessed health (Ludvigsson et al., 2018).

CONCLUSION

The presented data remind us that we should keep in mind the justification of the introduction of a gluten-free diet, and the potential damage to health when we observe adherence to this pattern of nutrition in the long run. Therefore, the recommendation is to weigh the possible benefits over the potential harm of gluten-free treatment. The questions posed are yet to be further answered through future studies designed for these purposes.

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BEZGLUTENSKA DIJETA NECELIJAČNIH SPORTISTA - BENEFITI I POTENCIJALNI ŠTETNI EFEKTI

Cilj ovog rada je da prikaže najnovije naučne podatke koji govore o bezglutenskoj dijeti, opravdanosti uvođenja dijete, prednostima i nedostacima ovakvog dijetarnog pristupa u populaciji sportista. Necelijačna glutenska senzitivnost (ranije definisana kao glutenska senzitivnost) je relativno nov klinički entitet prvi put definisan 2011.godine. Ovaj poremećaj karakterišu intestinalni simptomi (abdominalni bol, nadimanje, proliv i zatvor) i ekstraintestinalni simptomi kao što su glavobolja, hronični umor, poremećaj koncentracije, osećaj trnjenja u rukama i nogama kao i bolovi u mišićima, zlobovima i kostima. S obzirom da je većina simptoma subjektivna bez pratećih kliničkih znakova, a kako ne postoji specifičan biomarker za dijagnostikovanje u kliničkoj praksi uvek postoji dilema da li se zaista radi o ovom zdravstvenom problemu. Bezglutenska dijeta je postala popularna među sportistima zbog mišljenja da ima ergogene efekte. Takođe treba imati na umu da uvođenje bezglutenske dijete ima svojih nedostataka. Više studija upućuju da je bezglutenska dijeta deficitarna u integralnim žitaricama, dijetnim vlaknim i pojedinim mikonutrijentima. Podaci prikupljeni iz NHANES studije (prema engl. the National Health and Nutrition Examination Survey), ukazuju na postojanje veće koncentracije teških metala u uzorcima urina i krvi uzetih od osoba na bezglutenskoj dijeti što je posledica suženog izbora namirnica. Ovi podaci podsećaju da treba imati na umu opravdanost uvođenja bezglutenske dijete i potencijalnu štetu po zdravlje kada dugoročno posmatramo pridržavanje ovakavom obrascu ishrane.

Ključne reči: bezglutenska dijeta, sportisti, necelijačna glutenska senzitivnost, efekti