

Gluten Free Food in the diet of athletes

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Abstract - *The market for gluten-free food products (BPP) is expanding rapidly. The reasons for this reflect a growing public interest in the gluten-free diet. This is partly due to an increase in the number of people diagnosed with Celiac disease, as well as the trend of healthy eating habits. However, gluten-free analogues differ from traditional products in a number of sensory (organoleptic) characteristics, they are more expensive and have lower nutritional value. The purpose of this study is to provide an updated overview of the factors underlying the choice of gluten-free foods by athletes to achieve specific athletic performance. This includes socio-demographic factors, gluten intolerance factor, psychological factors, quality of life and others. Significance of factors affects athletes' commitment to a gluten-free diet. A review of the literature showed that most studies in this area are related to the need for a gluten-free diet due to health conditions and do not take into account the choice of gluten-free food products by athletes who do not have health problems. Here we discuss future areas of research, and what questions remain unanswered in the development of BPP technology.*

Keywords - *gluten-free food, celiac disease, gluten-free diet, nutrition for athletes*

I. INTRODUCTION

Over the past centuries, human life expectancy has increased, from about 29 years in 1800 to 63 years in 2018 (World Health Organization, 2018) [18]. This is largely due to the adoption by consumers of the concept of a healthy lifestyle. It is no secret that food is one of the main factors of health and, as a result, longevity. Especially for athletes, proper, balanced nutrition largely determines athletic success. The perception of food products not just as energy sources has led to an increase in demand for products that can affect the functioning of the body as a whole and its individual functions in particular. In 2017, we observed a growth in the market of "healthy" food products by 3.3% and 4.2%, respectively, in the Asia-Pacific region and the Middle East [9]. In Europe, the market value of such products in 2013 amounted to about 130 billion euros, and in 2018 the turnover amounted to 149 billion euros. Growth is observed in all areas, including in the field of BPP.

It is generally accepted that a product belongs to the category of gluten-free if its composition does not exceed 20 mg / kg of gluten [2, 17].

It is important to note that in this review, the term "Gluten-free product" refers to dietary (processed) gluten-free foods that are based on gluten-free ingredients instead of

gluten-free. We are talking about bread, cookies, pasta, bakery products and other products [8].

According to studies in the United States, Italy and the UK, the largest growth in the gluten-free products market occurred in 2012-2017 [15]. In 2016 alone, global BPP sales jumped 12.6%. For comparison, this year sales of other food products increased by only 4%, in connection with which it is planned to expand the retail market of BPP from \$ 1.7 billion in 2011 to \$ 4.7 billion by 2020 [7]. Given the overall picture of global growth in demand for BPP, it is worth understanding how and why this happened. This review allows you to understand the trends in the BPP market on the basis of several economic and psychological factors, as well as the risks faced by this market [11].

II. LITERATURE REVIEW

When predicting the BPP market, it is necessary first of all to take into account the increase in the number of people with Celiac disease. This disease has no nationality. It received the greatest distribution in the developed countries. According to studies, on average 1-2% of the world's population suffers from Celiac disease, but there is scientific evidence that this figure is underestimated [7, 12] In particular, according to the Italian Ministry of Health, 198 had a diagnosis of Celiac disease in 2016 427 Italians, but according to other sources, the real figure can reach 407,467 people [3].

The choice of gluten-free foods depends on changes in people's lives, their lifestyle and attitude to their own health. A diagnosis of celiac disease makes people more demanding on food choices. And the market is responding to growing demand by increasing the range of such products.

It is important to note that patients with Celiac disease are not the only consumers of BPP. These products are widespread among healthy people, in particular athletes. For example, in Italy, 6 million people who are not suffering from celiac disease build their daily diet on BPP, spending about 105 million euros per year. In addition, 37% of people under the age of 20 years, and 31% of people under the age of 34 are willing to pay an additional (increased) price for gluten-free analogues. The motives for this are very different. For example, family members of patients with Celiac disease follow a gluten-free diet at home, seeing them as a danger. Since Celiac disease is inherited, it is believed that the adoption of a gluten-free diet prevents the onset of illness in other family members. In addition, there is

scientific evidence that the adoption of a gluten-free diet has a positive effect on other conditions, such as autism, food allergies, and intolerance to wheat, eggs, soy, and milk [6].

Another reason people who do not have celiac disease follow a gluten-free diet is that today it has become a fashionable trend in a healthy lifestyle. Non-celiac consumers are often influenced by popular idols and celebrities who promote gluten-free foods as a way to stay in shape and as a means to boost energy levels. For example, Novak Djokovic, the world famous tennis player, who reported this in his book "Serve for Victory" (2013) [10].

There are a number of possible factors that contribute to understanding the growing BPP market. Thus, this systematic review addresses the following issues:

1. Identification of the most important factors affecting adherence to a gluten-free diet.
2. Analysis of significant signs regarding consumer willingness to pay a higher price for BPP
3. The differences between celiac disease and healthy people who choose a gluten-free diet for themselves.

III. MATERIALS AND METHODS

First, the initial research pool was built on launching searches in several key databases: Scopus, Web of Science, Elsevier's Science Direct, AgEcon Search, and Econ Papers. Three searches were conducted in each of the databases above:

1. The selection of articles related to the observance of the runaway diet by keywords.
2. The selection of articles related to the willingness to pay a higher price for BPP using keywords.
3. The selection of articles related to the intention to buy BPP, also, by keywords.

The studies reviewed for this review were evaluated for the period from January 2010 to September 2019.

Empirical research articles were selected based on the following criteria:

1. Published in English / Italian / Spanish
2. Exclusion of review articles
3. Adult studies

During this screening, articles were selected by examining the words "gluten-free", "diet," "willingness to pay," and "intention to buy," in their titles. At the third stage, 942 theses were prepared. Assessed for eligibility. 724 articles were deleted because they did not meet the criteria set out. Thus, 218 articles were selected, of which only 68 were found to be fully consistent with the objectives of this study.

IV. PRACTICAL SIGNIFICANCE

The information obtained from the review of articles shows: [2, 9, 14]

1. Celiac disease is a disease of Western countries. It is more common among the population of developed countries and less common among residents of developing countries.
2. Among adherents of a gluten-free diet, a considerable proportion of healthy people, including athletes, who consider BPP as a factor in health and longevity.

V. RESULTS

As can be seen from the review, most of the research in this area was conducted in Europe (mainly in the UK and Spain), and North America (mainly in the USA.) In addition, another key factor that is common to most studies is that the

studies were concentrated mainly way on patients with celiac disease.

Regarding the type of method choice, it can be argued that most studies focus on a quantitative approach. Nine studies used a qualitative approach to assessing the factors that influence adherence to a gluten-free diet. Most articles used a survey as a method of identifying factors that influence adherence to a gluten-free diet. The analysis allows us to identify the following factors for the selection of BPP:

1. Socio-demographic factors
2. Products with the logo "gluten-free"
3. Psychological factors
4. Symptoms associated with celiac disease
5. Celiac disease factors
6. Quality of life
7. Other factors

The rest of the study presents the results, organized in accordance with the classification of these factors.

Many studies show that adherence to a gluten-free diet also correlates with various aspects of gluten-free nutrition. These include nutritional attitudes, diet knowledge, the duration of a gluten-free diet, and other factors.

VI. CONCLUSION

Many products that typically contain gluten have gluten-free counterparts that are widely available at most grocery stores. Keep in mind that unprocessed fresh foods are an important part of a healthy gluten-free diet. Gluten-free diet is based on fruits, vegetables, meat and other BPP groups.

Most often, manufacturers label products "gluten-free", but there are also those that do not have such a label, nevertheless also belonging to the category of gluten-free. That is why careful study of the composition is of great importance. It is also important to remember that "without wheat" does not necessarily mean "without gluten". In addition to wheat, gluten is a source of food products prepared on the basis of barley, oats and rye. Therefore, consumer awareness is of great importance.

Typically, traditional wheat products, such as pasta, bread, crackers, and other baked goods, contain gluten. However, there are many variations of similar gluten-free products that use alternative types of flour and grain. An example is the replacement of rice wheat flour in the production of biscuit cake mix. It's easy to find gluten-free types of flour in the retail network, as well as flour mixtures that allow consumers to cook their own food at home.

Many ready-to-eat breakfasts contain gluten or wheat-based ingredients, although at first glance it may seem that they are gluten-free. For example, in the production of rice flakes, manufacturers often use flavors based on malt or its extract, which contain gluten.

Soups and sauces are one of the main sources of "hidden" gluten, as many manufacturers use wheat as a thickener. This applies more to canned soups.

Most drinks are gluten free, including juices, sodas and sports drinks. Wine is generally considered a gluten-free product. According to the University of Chicago Celiac Center, wines fermented in barrels lined with wheat paste (historically wines such as port, Madera and nutmeg) contain gluten in trace amounts and therefore cannot be considered gluten-containing. However, some types of wine contain an unsafe amount of gluten. Dyes and / or flavors are typically used in the production of such wines. This includes dessert wines as well as wines made from barley malt..

Alcoholic beverages, including spirits / distilled liquors / strong ciders, are also gluten free. Beer, ale, lagers, malt drinks are made from gluten-containing plant materials, and as a result, they are not gluten-free. However, there are several brands of gluten-free beer available in the United States and abroad.

Fresh and frozen fruits and vegetables are gluten free. However, even minor processing of the products (freezing) may also involve contact of the product with gluten-containing raw materials. An example is chopped, packaged and frozen potatoes, which are not always gluten-free.

The use of starches and refined flour with a low fiber content in the production of BPP leads to insufficient consumption of fiber. The rate of anemia in newly diagnosed celiac disease patients in the United States was 4%. Gluten-containing foods have a higher folate content than their gluten-free counterparts. Therefore, enrichment of BPP with folic acid is necessarily a direct responsibility of the manufacturer. Patients with celiac disease should focus on foods rich in vitamin B12 (such as meat, milk, fish and poultry), folic acid (such as dried beans and legumes, flax seeds, dark leafy greens and citrus fruits), iron (such as lean meat, poultry, and seafood), as well as foods with a high content of vitamin C, which promotes the absorption of iron. Amaranth, buckwheat, and quinoa are good sources of iron, fiber, and certain B vitamins.

Recent studies have shown a high prevalence of obesity in some patients with celiac disease. Almost half of all adult patients diagnosed with Celiac disease have a body mass index of 25 or more. However, among patients with celiac disease, obesity is more common in children. Increased calorie content of BPP can cause obesity. In addition, damage to intestinal villi can lead to problems in the digestion and absorption of food, which can also lead to the development of obesity.

In order to prevent bone problems, patients with celiac disease should use BPP, additionally fortified with calcium and vitamin D. These products include milk, cheese and calcium-fortified drinks, such as orange or apple juice, as well as fortified soy, almond or rice milk, yogurt, sardines or canned salmon with bones. Vitamin D-rich foods include marine fish and fish oil, egg yolk, liver, vitamin D-fortified milk, and some vitamin D-fortified drinks. In addition, patients should be advised to sunbathe more. The best time for this is the end of spring, summer and early autumn.

A gluten-free diet is necessary to control the signs and symptoms of a number of diseases:

1. Celiac disease is a condition in which gluten causes the activity of the immune system, which damages the mucous membrane of the small intestine. Over time, this damage prevents the absorption of nutrients from food. Celiac disease is an autoimmune disease.

2. Non-celiac sensitivity to gluten causes some signs and symptoms associated with celiac disease - abdominal pain, bloating, diarrhea, constipation, rash, headache. In this case, there may not be damage to the tissues of the small intestine. Studies show that the immune system plays a role, but this process has not been sufficiently studied to date.

3. Gluten-free ataxia is an autoimmune disease that affects certain nerve tissues and causes problems with muscle control and voluntary muscle movement.

4. Wheat allergy, like other food allergies, is the result of the immune system mistaking gluten or some other protein in wheat for a pathogen such as a virus or bacteria. The immune system creates an antibody to the protein, causing an immune

system reaction that can lead to the symptoms described above.

Promoting the health benefits of a gluten-free diet is a motivation for healthy people to avoid wheat and other cereals containing gluten. To date, not enough research has been done on the effects of gluten-free foods on healthy people. Therefore, this issue remains open.

There are several types of BPP:

1. Food products that do not contain gluten-containing ingredients.

2. Food products that are not in contact with gluten-containing ingredients during the manufacturing process.

3. Food products containing gluten, which were subsequently processed to remove gluten.

4. Alcoholic beverages made from natural gluten-free ingredients such as grapes or juniper berries can be labeled as gluten-free. An alcoholic beverage made from gluten-containing raw materials and labeled with a label that indicates information on the appropriate processing of the product in order to remove gluten. However, in this case, the label should also contain information that contains.

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