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Gluten-free diet and oncological prevention – the importance of a conscious lifestyle for physically active people – A Literature Review

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Abstract:

Introduction: Celiac disease is a chronic autoimmune disorder triggered by gluten ingestion in genetically predisposed individuals. If untreated, it leads to villous atrophy, chronic inflammation, and immune dysfunction. Studies show that active, untreated celiac disease increases cancer risk, particularly for lymphomas and gastrointestinal malignancies. The only effective treatment is a gluten-free diet. Recent research also suggests that regular physical activity may help modulate inflammation and boost immunity, potentially lowering cancer risk in autoimmune conditions like celiac disease.

Aim of the Study: This review examines whether celiac patients are more prone to cancer and how a gluten-free diet modifies this risk. It focuses on cancers commonly linked to celiac disease—lymphomas, small intestine, esophageal, and hormone-related cancers—based on epidemiological, clinical, and pathophysiological studies.

Materials and Methods: This review analyzes recent scientific literature, including cohort studies and meta-analyses, on the link between celiac disease and cancer. Increased risks are most evident for enteropathy-associated T-cell lymphoma, small intestine adenocarcinoma, and esophageal squamous cell carcinoma. Risk factors include chronic mucosal inflammation and immune dysregulation, especially before diagnosis or in those not adhering to dietary guidelines.

Conclusions: A gluten-free diet is crucial for symptom control and cancer prevention, promoting mucosal healing and immune normalization. Long-term adherence significantly lowers cancer risk, often to general population levels. While data on stomach and colon cancer remain mixed, no elevated risk is seen in compliant patients. Interestingly, hormone-related cancers (e.g., breast, ovarian) may be less common, possibly due to altered hormone levels. Importantly, regular physical activity offers added protection by reducing inflammation and improving immune function.

Keywords: gluten-free diet, physical activity, celiac disease, healthy lifestyle, cancer

Introduction

Gluten is a complex protein network found in wheat flour, which is characterized by a wide range of sizes [1]. Its composition is influenced by factors such as genotype, cultivation conditions, and technological processes [1]. It consists of two main groups of proteins known as gliadin and glutenin. The intermolecular bonds between these fractions give lightness and fluffiness to bread products [2]. Gliadin- and glutenin-like storage proteins also occur as secalin in rye, hordein in barley, and avenin in oats and are collectively known as "gluten" [3]. Gluten-related disorders (GRD) is a term encompassing conditions caused by gluten ingestion [4]. The development of disorders is currently being contributed to by the increasingly popular highly processed diet, based on large amounts of gluten and saturated fats [5]. People with gluten sensitivity also often develop celiac disease, an inflammatory disease of the small intestine that in genetically predisposed individuals leads to atrophy of intestinal villi and increased numbers of lymphocytes in the mucosa, leading to infiltration [6,7]. It can manifest

at any age, most often in childhood or middle age [8]. It is estimated that the disease affects approximately 1% of the population, but its true incidence may be higher due to numerous undiagnosed cases [9]. The gluten-related disorders listed may also cause non-celiac gluten sensitivity, wheat allergy, and dermatitis herpetiformis, and consequently predispose to cancer [10]. Population studies have shown that people with active, untreated celiac disease are at particular risk of developing enteropathy-associated lymphoma (EATL), cancer of the small intestine, esophagus, and oropharynx [11,12]. This phenomenon is caused by chronic inflammation of the intestinal mucosa and impaired immune function. A strict gluten-free diet – the only effective treatment for celiac disease – leads to the reconstruction of the intestinal mucosa, reduced inflammation, and a lower risk of malignant transformation [13].

In recent years, additional lifestyle factors such as physical activity have gained attention in the context of cancer prevention in patients with chronic inflammatory diseases. A growing body of evidence supports the role of regular moderate exercise in modulating immune responses, lowering systemic inflammation, and improving metabolic homeostasis, all of which may influence the risk and progression of malignancies in individuals with autoimmune conditions, including celiac disease. For instance, Steindorf et al. highlight that physical activity is associated with a reduced risk of gastrointestinal cancers, emphasizing its potential as a complementary preventive strategy alongside dietary interventions [14].

The aim of this paper is to review the current literature on the impact of a gluten-free diet on the risk of developing cancer in people with celiac disease and to present data on the incidence of cancer in patients with CD.

Celiac disease and esophageal cancer

The association between celiac disease and an increased risk of developing esophageal cancer has been epidemiological studies and meta-analyses. The meta-analysis by Han et al., including 17 studies documented in several, showed a significantly higher risk of developing esophageal cancer in patients with celiac disease. The cumulative hazard ratio (OR) for esophageal cancer was 3.72 (95% CI: 1.90–7.28), suggesting a more than three-fold increased risk compared to the general population. Additionally, subgroup analysis indicated that the risk was highest in the peri-diagnostic period (OR = 4.02; 95% CI: 1.54–10.52), while it decreased in the period after diagnosis and implementation of dietary treatment (OR = 2.17;

95% CI: 1.34–3.51), which may indicate a protective effect of a gluten-free diet after early diagnosis of the disease [15]. In turn, in a population study conducted by van Gils et al. in the Netherlands, analyzing data from 28 patients with celiac disease and esophageal cancer and 28,070 patients with esophageal cancer without celiac disease, found that the risk of developing esophageal squamous cell carcinoma was significantly higher in patients with celiac disease (RR = 3.5; 95% CI: 2.1–5.8). Importantly, the risk of developing esophageal adenocarcinoma was not significantly increased (RR = 1.5; 95% CI: 0.8–2.6), which may suggest a selective effect of immune mechanisms typical of celiac disease on specific types of esophageal cancers [16]. Proposed pathogenic mechanisms include chronic inflammation of the esophageal mucosa resulting from autoimmune activation in the course of celiac disease. Such inflammation can cause damage to the esophageal epithelium, leading to metaplasia and then to dysplastic changes that predispose to neoplastic transformation [17]. It should also be noted that conditions predisposing to the development of esophageal cancer are more common in people with celiac disease. An example is the article by Maieron et al., which showed a higher incidence of Barrett's esophagus, most often manifested by a feeling of heartburn, belching or regurgitation of gastric contents into the esophagus, in people with celiac disease compared to a control group matched for sex and age, in whom gastroscopy was performed for other indications [18]. Plummer-Vinson syndrome, manifested by iron deficiency anemia, dysphagia and the presence of thin septa present in the esophagus, which limit its lumen, which is associated with an increased risk of squamous cell carcinoma, is also more common in people with celiac disease. In the study by Holmes et al. , which included 210 patients with celiac disease followed for over 11 years, a significantly increased risk of developing esophageal cancer was found in those not following a gluten-free diet. In this group, the relative risk (RR) for esophageal cancer was 12.3 (95% CI: 2.5–36.5; $p < 0.01$), whereas patients following a gluten-free diet for at least five years did not have an increased risk of cancer compared with the general population. Additionally, the authors observed a clear trend towards a decrease in cancer risk with increasing the duration of gluten-free diet, suggesting its protective effect against malignant transformation in celiac disease.[19] A study by Emilsson et al. from Sweden, including 47,241 patients with celiac disease, found that the risk of developing esophageal cancer was significantly increased in the first year after diagnosis (HR = 2.47; 95% CI: 2.22–2.74), but after that time the risk did not differ from the general population (HR = 1.01; 95% CI: 0.97–1.05). These results suggest that early detection of celiac disease and prompt implementation of a gluten-free diet may reduce the risk of developing esophageal cancer. The reason for the increase in the disease in the first year could

be the detection during intensive diagnostics related to symptoms leading to the diagnosis of celiac disease. After this period, the overall risk of cancer decreased and did not differ significantly from the general population. [20]. In contrast to the results of European studies, analyses conducted in the United States have shown that the risk of developing esophageal cancer in people with celiac disease may be increased regardless of adherence to a gluten-free diet. Landgren and co-authors, analyzing data from more than 4.5 million American veterans, 289 thousand of whom had autoimmune diseases, found a significantly higher incidence of esophageal cancer among patients with celiac disease – even those on a gluten-free diet. [21]

Celiac disease and stomach cancer

A meta-analysis by Han et al. including 17 studies showed that patients with celiac disease had a moderately increased risk of stomach cancer (OR = 1.53; 95% CI: 0.96–2.44), although this result did not reach statistical significance. The authors suggested that chronic inflammation may play a role in gastric carcinogenesis in this group of patients [15]

Similarly, the study by Elfström et al. conducted on a population of 28,882 patients with celiac disease showed no significant increase in the risk of stomach cancer, however, the authors noted that the lack of data on the duration of the disease before diagnosis may underestimate the risk in people with long-term untreated celiac disease [22]

From a pathophysiological point of view, one of the main risk factors for stomach cancer in patients with celiac disease may be the concomitant autoimmune gastritis (AIG), which often occurs with hyposecretion of hydrochloric acid and pepsinogen, as well as the presence of autoantibodies against parietal cells and intrinsic factor [23]. Hypoacidity leads to increased colonization of the stomach by nitroreductive bacteria, including Helicobacter pylori, which can result in chronic inflammation and intestinal metaplasia — considered a precancerous condition [24]

In a large cohort analysis by Askling et al., including a Swedish population of hospitalized patients diagnosed with celiac, the incidence of various malignancies was assessed in comparison with the general population and nonelevated during childhood and adolescence. [25]

Celiac disease and small intestine cancer

Celiac disease, a chronic autoimmune disease of the small intestine, is associated with an increased risk of developing adenocarcinoma of this part of the gastrointestinal tract. Although small intestine cancers are rare, their incidence in patients with celiac disease is significantly higher than in the general population. A meta-analysis by Han et al., including 17 studies involving 79,991 patients with celiac disease, showed that the risk of developing small

intestine adenocarcinoma was significantly increased (OR = 14.41; 95% CI: 5.53–37.60). The analysis showed that this risk was highest in the period before and immediately after the diagnosis of celiac disease (OR = 17.08; 95% CI: 3.59–81.20), which may suggest the presence of a neoplastic process before the diagnosis of celiac disease.[15]Emilsson et al. in a cohort study of 48,119 patients with celiac disease and 239,249 control population individuals found a three-fold higher risk of developing small intestinal adenocarcinoma in patients with celiac disease (HR = 3.05; 95% CI: 1.86–4.99). Importantly, the authors noted that in individuals whose mucosa regenerated after the introduction of a gluten-free diet, the risk of cancer was significantly lower, which underlines the protective role of strict dietary therapy. [20] Additionally, the narrative review by Montorsi et al. summarizes the results of numerous studies that confirm the increased risk of small intestinal adenocarcinoma in patients with celiac disease. [26] For example, the study by Askling et al. in Sweden showed a ten-fold higher risk (RR = 10.0; 95% CI: 4.4–20), and the study by Green et al. in the USA – a thirty-four-fold higher risk (RR = 34.0; 95% CI: 24–42). [25 , 27] It is also worth noting that this risk was particularly high in the first year after the diagnosis of celiac disease, which underlines the importance of early diagnosis and treatment of the disease. The British Gastroenterological Society reviewed all cases of small bowel cancer registered in the UK between 1998 and 2000. Of the 395 cancers diagnosed, 175 were adenocarcinomas. Thirteen percent of patients with this type of cancer (n = 23) had previously been diagnosed with coeliac disease. However, it is worth noting that only 63% of these patients were following a gluten-free diet at the time of diagnosis. [28]

Celiac disease and colon cancer

Celiac disease, a chronic autoimmune disease of the small intestine, is associated with an increased risk of certain gastrointestinal cancers, but its association with colon cancer remains ambiguous. Most available data suggest that patients who follow a gluten-free diet do not have a significant increase in the incidence of this cancer, and in some studies, this risk even decreases. The meta-analysis by Han et al., covering 17 studies, showed an increased incidence of gastrointestinal cancers in patients with celiac disease, particularly esophageal and small intestine cancer, but no significant association with colon cancer was confirmed (OR = 1.60; 95% CI: 1.39–1.84). [15] This is confirmed by data from the cohort study by Volta et al., which included 1757 patients, in which after an average follow-up of 18.1 years, only 6 cases of colon cancer were recorded (SIR = 0.29; 95% CI: 0.07–0.45), and among those who strictly followed the diet, this result dropped to SIR = 0.07 (95% CI: 0.009–0.27).[29] Similar observations were made in the analysis by Freeman, where 154 people with

celiac disease were observed over a 30-year period and no significant incidence of colon cancer was found, even in the older age group. [30]Also, the meta-analysis by Lasa et al., including 367 patients with celiac disease and 682 control subjects, did not show an increased incidence of colorectal adenomas (OR = 0.94; 95% CI: 0.65–1.38), and in the retrospective study by Pereyra et al., including 118 patients and 236 control subjects, no differences were found in the occurrence of polyps, adenomas or advanced neoplastic lesions. [31, 32]. In turn, the large population-based study by Onwuzo et al., including over 47 million people, showed an increased risk of colorectal cancer in patients with celiac disease (OR = 10.18; 95% CI: 9.72–10.65), although the authors emphasize the need for further analyses to confirm this result and understand its mechanisms. The results of colonoscopic examinations are also inconclusive – in one of the analyses conducted in a group of 180 patients with celiac disease, glandular polyps were found in 12% of the examined (mainly of tubular structure), while in the control group (59 people) – in 17% (also tubular polyps dominated). [33]. Similar results were obtained by Gonzales et al., analyzing colonoscopies in 44 patients with celiac disease, and their further studies showed that failure to follow a gluten-free diet results in an almost seven-fold increase in the risk of polyps compared to people who followed dietary recommendations. [34]. This is also confirmed by the analysis of Dickey et al., in which 69 patients on a gluten-free diet and 100 people from the control group without celiac disease were assessed – despite frequent symptoms such as iron deficiency or bowel disorders, no differences in the frequency of adenomas were noted between the groups. All these results indicate that following a gluten-free diet may have a protective effect and the incidence of precancerous changes in patients with celiac disease does not differ from that observed in the general population, while ignoring dietary recommendations may significantly increase the risk of developing glandular polyps and potentially also colon cancer. [35].

Celiac disease and lymphoproliferative disorders

Celiac disease, as a chronic autoimmune disease leading to damage of intestinal villi in response to gluten consumption, is associated not only with the risk of malabsorption but also with an increased risk of developing lymphoproliferative neoplasms (LPM), especially lymphomas. The most frequently observed cancer of this type is enteropathy-associated T-cell lymphoma (EATL), but also diffuse large B-cell lymphoma (DLBCL), non-Hodgkin lymphomas (NHL) and Hodgkin lymphoma (HL).The relationship between celiac disease and lymphoproliferative neoplasms has been the subject of numerous population studies. In a study by Gao et al. conducted in Sweden among over 60,000 patients with HL, CLL and NHL and over 200,000 control subjects, 7 cases of celiac disease were found among patients with

HL, 4 among patients with CLL and as many as 54 cases of celiac disease in patients with NHL. In the control group, CD was detected in only 40 people. This means a 5-fold higher risk of NHL in patients with celiac disease than in the general population. Importantly, this risk was particularly high in the first years after the diagnosis of CD and persisted for up to 10 years, although with a tendency to regression in the following years – probably due to dietary treatment. [36]. However, other studies, e.g. Scottish, indicate that the increased risk may persist even 15 years after diagnosis. [37] Italian data also indicate a significant association between CD and cancer. In the analysis conducted by Volta et al. in a group of 1757 patients with celiac disease, a higher incidence of cancers, especially lymphomas, was observed. [29]. Italy plays an important role in research on the influence of diet on the development of lymphoproliferative neoplasms. In one study conducted by Italian researchers, a 6-fold higher than expected incidence of T-cell NHL was found among patients with celiac disease, including those who did not follow a gluten-free diet. In turn, among patients with NHL who followed a gluten-free diet, only 2 people followed it for more than 3 years, and as many as 5 people declared that they did not follow the diet. The results of these studies clearly indicate the protective nature of the gluten-free diet in the context of the development of lymphomas, especially those of the T-cell phenotype. [38]. Another covering 1,072 patients with celiac disease found significant changes in the frequency of cancer deaths, mainly non-Hodgkin lymphoma (NHL). In this group, 53 deaths were observed, many of them caused by NHL. It is worth adding that studies in Italy have shown that a gluten-free diet significantly reduced the risk of developing lymphomas, especially in patients who followed dietary recommendations. The aforementioned studies indicate that the risk of developing NHL lymphoma is much lower in patients who regularly follow a gluten-free diet. Moreover, the authors of these analyses emphasized that among patients who did not follow the diet for a longer period of time, this risk was six times higher than in those who followed a gluten-free diet for at least 3 years. [39] Lebwohl et al. analyzed the effect of intestinal villi reconstruction after a gluten-free diet in 7,625 patients with celiac disease on the incidence of LPM. [40] Similarly to the study by Howdle et al., it was shown that in the group of people with persistent intestinal villi atrophy, the risk of LPM is higher than in the general population. However, the incidence of LPM, compared to the group of patients with celiac disease in whom intestinal villi were rebuilt, is similar. [28] Further detailed analysis revealed an increased risk of developing NHL in individuals with persistent intestinal villous atrophy. An association was also found between persistent severe villous atrophy and an almost 4-fold increased risk of developing LPM in patients with celiac disease. In this group, there was also

an over 9-fold increased risk of developing LPM in patients with celiac disease compared to the general population. [40]

Celiac Disease and breast cancer and genital cancers

Celiac disease, as a chronic autoimmune disease leading to damage to the mucosa of the small intestine, causes a number of systemic health consequences, including endocrine disorders. Increasing importance is attributed to the relationship between celiac disease and hormone-dependent cancers, such as breast, ovarian or endometrial cancer. The mechanisms proposed in the literature include chronic inflammation, malnutrition and hormonal disorders. In a large cohort study by Lebwohl et al. ,including 47,241 patients with celiac disease and 229,000 control subjects, the cumulative risk of cancer was estimated. No significant increase in the risk of breast cancer was found (HR = 0.97; 95% CI: 0.89–1.06), suggesting a lack of a positive association between celiac disease and the incidence of this cancer [41] In a study by Ludvigsson et al. in Sweden, including 17,852 women with celiac disease and 88,400 controls, a reduced risk of hormone-dependent cancers was observed in patients with celiac disease. The analysis showed a reduced risk of breast cancer (HR = 0.85; 95% CI: 0.72–1.01), endometrial cancer (HR = 0.60; 95% CI: 0.41–0.86), and ovarian cancer (HR = 0.89; 95% CI: 0.59–1.34). After excluding the first year of follow-up, the risk of breast cancer was further reduced (HR = 0.82; 95% CI: 0.68–0.99), suggesting that this effect is not due to diagnostic errors or early detection. The study authors suggest that reduced exposure to estrogens, resulting from malnutrition and malabsorption typical of untreated celiac disease, may play a protective role against the development of estrogen-dependent cancers. Additionally, earlier menopause in women with celiac disease may contribute to a reduced risk of these cancers. [42] It is also worth mentioning the study by King et al., which showed a significantly lower risk of breast cancer in the group of women with celiac disease (SIR = 0.85; 95% CI: 0.74–0.97). These results confirm the observations regarding reduced exposure to steroid hormones, which may affect cell proliferation in the glandular tissue of the breast [43]. In addition to breast cancer, the risk of gynecological cancers was also analyzed. In the study by Lebwohl et al., covering over 7,000 patients, did not show an increased risk of ovarian cancer, but Italian and Scandinavian studies suggest ambiguous results in this area. Some of them indicate a potential reduction in risk among patients who strictly follow a gluten-free diet, which may be related to normalization of gonadotropin and estrogen levels after stabilization of small intestine function. [40]. In the study by Prasad et al. , conducted on a group of 200 women with celiac disease and 200 healthy volunteers, a significantly higher incidence of delayed menarche, secondary amenorrhoea, and reduced fertility was found in patients with celiac

disease. Importantly from the oncological perspective, these disorders suggest lower exposure to sex hormones, especially estrogens, which are key factors promoting the development of hormone-dependent cancers, including breast, endometrial and ovarian cancer [44]. Lower levels of AMH (anti-Mullerian hormone), observed in the study by Cakmak et al. in women with celiac disease, may indicate reduced ovarian reserve and impaired ovarian hormonal function. This may lead to earlier cessation of hormonal activity and reduced total exposure to estrogens throughout life.[45]

A gluten-free diet, as a basic element of celiac disease therapy, may have a preventive effect in the context of some cancers. Lebwohl et al. showed that patients who followed the diet for at least three years had lower rates of cancer, including hormone-dependent cancers. Although these results did not reach full statistical significance, they suggest a beneficial effect of gluten elimination on inflammation and hormonal balance [40].Obesity is a well-documented risk factor for many cancers, including endometrial and breast cancer. Mechanisms include increased estrogen production in adipose tissue, insulin resistance, and chronic inflammation. Women with celiac disease who follow a gluten-free diet may experience improved nutritional status and weight gain, leading in some cases to overweight or obesity. A study by Ludvigsson et al. found a reduced risk of endometrial cancer in women with CD (HR = 0.60; 95% CI: 0.41–0.86), which may be related to the lower BMI and lower estrogen exposure in this population. However, as nutritional status improves and body weight increases occur, this risk may change. [42]

Discussion

A gluten-free diet, which is the basis of celiac disease treatment, can have a significant impact on reducing the risk of developing cancers, including breast and genital cancers. A gluten-free diet is effective in rebuilding intestinal villi, which can reduce inflammation and improve the functioning of the immune system. It is known that this diet not only improves intestinal health, but can also reduce the risk of cancers, including those affecting the breast and genitals.Lebwohl et al. indicate that the reconstruction of intestinal villi after the implementation of a gluten-free diet significantly reduces the risk of lymphoproliferative neoplasms (LPM), but may also have a beneficial effect on reducing the risk of hormone-dependent cancers, such as ovarian or breast cancer. A gluten-free diet leads to a reduction in chronic inflammation, which may reduce the risk of developing these cancers, although this relationship has not yet been fully explained.

It is worth noting that in studies of patients with celiac disease who followed a gluten-free diet, the risk of developing genital cancers, including ovarian cancer, was lower than in those who

did not follow the dietary recommendations. In turn, failure to follow the diet was associated with a higher risk of developing these cancers, as emphasized by, among others, the results of studies in Sweden and Italy.The aim of this study was to analyze the effect of a gluten-free diet on the risk of developing cancer in patients with celiac disease. Celiac disease, as a chronic autoimmune disease, is associated not only with damage to the mucosa of the small intestine, but also with systemic inflammation, which can lead to carcinogenesis. This problem is particularly important because numerous studies indicate an increased risk of many cancers in people with untreated celiac disease, including lymphomas (especially enteropathic T-cell lymphoma), gastrointestinal cancers (esophagus, stomach, small intestine), as well as hormone-dependent cancers - such as breast, ovarian or endometrial cancer. A review of the available literature revealed a clear pattern: the highest risk of cancer is observed in the peridiagnostic period, especially in long-term untreated disease. At the same time, almost all studies have shown that the implementation and long-term adherence to a gluten-free diet reduces this risk - both by rebuilding intestinal villi and calming inflammation, as well as by stabilizing the immune response. The greatest benefits were observed in relation to lymphomas and cancers of the small intestine and esophagus, but breast and reproductive organ cancers were also less common in people who followed the diet. Importantly, people who strictly follow the dietary recommendations for at least 3 years achieve a cancer risk comparable to the general population. The results of the study clearly show that a gluten-free diet has not only a therapeutic function, but also a preventive one, and can be an effective tool for reducing the risk of cancer in patients with celiac disease.A gluten-free diet is currently the only effective treatment for celiac disease and at the same time protects against the development of cancer. Regular use of a gluten-free diet allows for the reconstruction of the mucous membrane of the small intestine, reduction of chronic inflammation and normalization of the immune response. Studies have shown that patients who follow a gluten-free diet have a significantly lower risk of developing lymphomas, small intestine cancer or esophageal cancer. Moreover, long-term use of the diet may also reduce the risk of breast and genital cancer in women.

Limitations of the study

Despite many valuable data, the study has some limitations. First of all, a large part of the analyses is based on retrospective and population data, which may introduce errors resulting from inaccurate medical records or lack of information on the duration of celiac disease before its diagnosis. Not all studies included information on the degree of adherence to a gluten-free diet, which may significantly affect the interpretation of cancer risk. In addition,

some analyses did not take into account important variables such as smoking, obesity or genetic factors, which may also affect the risk of developing cancer. Therefore, the results should be interpreted with caution and the need for further studies with more precise control of confounding variables should be emphasized.

Future research directions

Future studies should focus on prospective monitoring of large cohorts of patients with celiac disease, taking into account detailed data on the duration of the disease, adherence to the diet and other risk factors for cancer. It is advisable to conduct molecular and immunological studies that will allow for a better understanding of the mechanisms of carcinogenesis in the course of celiac disease. It is also worth analyzing the effect of the length and quality of the gluten-free diet on the level of the intestinal microbiota and inflammation. The development of methods for monitoring the regeneration of intestinal villi may allow for early identification of patients with high cancer risk and appropriate preventive measures.

Conclusions

In summary, the data presented in the paper indicate a significant relationship between celiac disease and an increased risk of developing cancers, especially in the gastrointestinal tract and lymphatic system. Implementing a gluten-free diet significantly reduces this risk, especially when it is used long-term and consistently. This diet not only alleviates the symptoms of the disease, but can also play a role in oncological prevention. Moreover, physical activity – as a proven factor supporting immune function, reducing systemic inflammation, and maintaining a healthy body weight – may additionally enhance the protective effects of a gluten-free diet. Incorporating regular, moderate exercise into the lifestyle of patients with celiac disease could further reduce cancer risk and contribute to overall well-being. Despite certain limitations of the study, the results confirm the need for early diagnosis of celiac disease and education of patients on the importance of strict adherence to dietary recommendations and maintaining an active lifestyle. Further studies can even more precisely determine the effect of a gluten-free diet and physical activity on individual types of cancers and improve the quality of care for patients with celiac disease.

Disclosure

Author's contribution

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