Dietary intake and nutritional status of inflammatory bowel disease patients

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HÁSKÓLI ÍSLANDS

Neysla og næringarástand sjúklinga með bólgusjúkdóma í meltingavegi

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Ágrip

Inngangur og markmið: Sjúkdómsferli bólgusjúkdóma í meltingarvegi getur leitt til margra næringartengdra vandamála. Markmið þessarar rannsóknar var að kanna mataræði og næringarástand hjá sjúklingum með bólgusjúkdóma í meltingarvegi og að kanna hvaða fæðutegundir eru tengdar sjúkdómsvirkni.

Aðferðir: Alls tóku 78 sjúklingar (35 karlmenn og 43 konur á aldrinum 18-74 ára) þátt í rannsókninni og var meirihlutinn (80%) í Infliximab lyfjagjöf. Þáttakendur svöruðu spurningalistum og fylltu út þriggja daga matardagbækur. Líkamssamsetning var mæld og blóðsýni tekin og könnuð var fylgni milli neyslu, inntöku, næringarástands og sjúkdómseinkenna.

Niðurstöður: Meirihluti þáttakenda eða 87% töldu að mataræði hafi áhrif á sjúkdóms-einkenni og 72% hafa breytt mataræði sínu eftir greiningu. Algengustu fæðutegundirnar sem fólk neytir minna af eða sleppir voru mjólkurvörur (60%), unnar kjötvörur (55%), gosdrykkir (46%) og skyndibiti (44%). Flestir þáttakendur voru í ofþyngd (líkamsþyngdarstuðull=25-29.9) en 46% þáttakenda hefur verið greindur með einhverskonar næringarskort síðan þeir greindust með IBD (flestir með járnskort: 39%). Þáttakendur sem takmarka neyslu á kjötvörum voru með lægri ferritín gildi (47.5±38.6 vs. 95.1±73.5µg/L, P=0.011). Kalk og D-vítamín inntaka er ekki fullnægjandi en 65% þáttakenda nær ekki ráðlögðum dagskammti af D-vítamíni eða kalki úr fæðu og voru 60% þáttakenda með D-vítamín blóðgildi undir 50 nmol/L.

Ályktun: Sjúklingar breyta oft mataræði sínu til að reyna að hafa áhrif á sjúkdómseinkenni. Margir sjúklingar hafa verið greindir með næringarskort. Takmörkun á neyslu á mjólkurvörum og kjöti er algeng og getur haft neikvæð áhrif á inntöku og næringarástand steinefna eins og kalk og járn. Mælt er með að sjúklingar fái ráðleggingar frá næringarfræðingi og notkun á fæðubótarefnum fyrir þá sem eru í skorti.

Abstract

Background and aims: Inflammatory bowel disease (IBD) can lead to many nutritional problems. The aim of this study was to investigate diet and nutritional status of IBD patients.

Methods: A total of 78 participants (35 men and 43 women aged 18-74 years) were included in this cross-sectional study, the majority (80%) receiving infliximab treatment. Participants filled out disease related questionnaires and a 3-day food record. Body composition was measured and blood samples were analyzed in order to estimate nutritional status.

Results: The majority (87%) claimed that diet affects disease symptoms and 72% had changed diet accordingly. The most common foods restricted were dairy products (60%), processed meat (55%), soft drinks (46%), alcohol (45%) and fast food (44%). Body mass index was mostly in the overweight range (BMI= 25-29.9) but 46% of the participants had been diagnosed with some nutritional deficiency since IBD diagnosis (most common iron deficiency: 39%). Patients who restricted meat products had lower ferritin values (47.5±38.6 vs. 95.1±73.5µg/L, P=0.011). Intakes of vitamin D and calcium were not adequate (65% below recommended intake for both) and 60% had poor vitamin D status.

Conclusion: IBD patients often change their dietary intake in order to affect disease symptoms. Many patients have a history of nutrient deficiency. Restriction of dairy and meat intake is common and can negatively influence intake or status of micronutrients like calcium and iron. Dietary advice by a dietician and use of potentially helpful dietary supplements is indicated.

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Abbreviations

IBD	Inflammatory bowel disease
CD	Crohn's disease
UC	Ulcerative Colitis
IBS	Irritable bowel syndrome
TPN	Total Parenteral Nutrition
EN	Enteral Nutrition
BCM	Body cell mass
BMD	Bone mineral density
EFCCA	European Federation of Crohn's and Ulcerative Colitis Associations
ECCO	European Crohn's and Colitis Organization
HRQOL	Health-related quality of life
TNFα	Tumor necrosis factor α
CRH	Corticotropin-releasing hormone (CRH)
DSCG	Disodium cromoglycate
GI-	Gastro intestinal-
CCU	Crohn's and Colitis Ulcerosa organization
25-OHD	25-hydroxyvitamin D

1. INTRODUCTION

Crohn's disease (CD) and Ulcerative colitis (UC) are both chronic, relapsing and remitting diseases. Millions of people around the world suffer from these diseases but the etiology and pathogenesis is still not entirely known [1, 2]. When diagnosed with Crohn's or Ulcerative colitis, patients face many challenges. Some patients manage to have somewhat normal life with the proper medications while others have repeated relapses and many complications [3].

Very little is known about the diet of these patients as studies on dietary habits and nutritional status are scarce and no such research has been ever conducted in Iceland. It is necessary to conduct this type of research in order to explore nutritional status, diet and symptoms.

The aims of the thesis were to:

1. Study the diet and nutritional status of IBD patients in Iceland.
2. Study which type of foods are connected to disease symptoms.
3. Study whether disease associated food preferences are related to nutrient intake or nutritional status.

In this study we used data from questionnaires, body composition measurements, three day food records and blood samples and aimed to see correlations between consumption, intake, nutritional status and disease symptoms.

The thesis is based on a review of the literature with the respect to the aims of the thesis and the following manuscript:

Dietary intake and nutritional status of inflammatory bowel disease patients.

2. REVIEW OF THE LITERATURE

Inflammatory bowel disease – definition

IBD is an inflammatory condition of the colon and small intestine. The major types are Crohn's disease (CD) and Ulcerative colitis (UC), both of which are chronic, relapsing and remitting diseases. The symptoms of these two illnesses are similar but different areas of the gastrointestinal tract (GI tract) are affected. Crohn's disease mostly affects the end of the small bowel (ileum) and the beginning of the colon but may affect any part of the GI tract from mouth to anus. It can affect the entire thickness of the bowel wall and there can be normal areas between patches that are not inflamed [4]. Crohn's can be diagnosed at any stage of life but it is most commonly diagnosed in people aged between 15 and 29 and it is somewhat more common in females than males [5]. Clinical symptoms of CD are heterogeneous and include diarrhea, abdominal pain, weight loss, malaise, anorexia and fever [6]. About 70-75% of patients with Crohn's require surgery at some point to relieve symptoms if drug treatment fails to correct complications. It is rarely curative but can lead to long lasting remission after surgery [7].

Ulcerative colitis is limited to the colon and the inflammation only involves the innermost lining of the colon. Ulcerative colitis does not leave unaffected patches [4]. Symptoms of UC depend on extent and severity of the disease and include bloody diarrhea, rectal bleeding and rectal urgency [6]. About 25-30% of UC patients may require surgery and surgical resection in UC is considered curative for the disease [7]. Like Crohn's, Ulcerative colitis may present at any stage of life. The diagnosis is most frequent in younger people but it can also be diagnosed in those aged between 60 and 80 years. UC is less common in younger children but when diagnosed the disease extent is likely to be extensive [1].

The main medications used in IBD are aminosalicylates (anti-inflammatory agents), corticosteroids, immune modifiers, anti-TNF agents, antibiotics, probiotics and some experimental agents [7].

Etiology and pathogenesis

The etiology and pathogenesis remain still to be elucidated. Genetic influences and immune mediated cytokine gene activation is associated with the induction and/or exacerbation of IBD along with various specific and non-specific environmental factors [2]. Geography, cigarette smoking, sanitation and hygiene are examples of environmental factors and infectious

microbes, ethnic origin and dysregulated immune system can all result in mucosal inflammation [8]. In a large population-based cohort study in UK with more than a million subjects it was demonstrated that childhood antibiotic exposure was associated with IBD development. Increasing early and cumulative exposure was directly associated with IBD risk. These findings are consistent with the hypothesis that antibiotic exposure might alter gut flora and trigger increased inflammation in some individuals. Children with extreme social deprivation were less likely to develop IBD, which is accordant with the "hygiene hypothesis" [9]. This hypothesis suggests that an environment with a high incidence of infectious diseases protects against allergic and autoimmune diseases and hygienic surroundings increase the incidence of these disorders [10]. Incidence of Crohn's disease is also higher in urban areas than in rural environment and the prevalence of the disease increased in 1990-2000 in built-up urban districts [2]. Incidence of IBD was compared to the prevalence of lactose intolerance in several countries. IBD is rare where lactose intolerance is highly prevalent, which might indicate that lactose intolerance could protect against development of IBD [11].

Epidemiology

The incidence rates and prevalence of Crohn's disease and Ulcerative colitis are highest in northern Europe, the UK and North America. In low-incidence areas such as southern Europe, Asia and most developing countries, the rates continue to rise. Prevalence rates in North America of Crohn's disease are much higher in white and African- American individuals than for Hispanic and Asian people [1, 8]. In 2004 it was estimated that in the United States 1.4 million persons suffer from these diseases and in Europe 2.2 million persons [1]. In an article published in 2013, Burisch et al. claim that 2.5-3 million people in Europe are affected by IBD or 0,3% of the population, with direct healthcare cost of 4.6-5.6 billion Euros/year. The prevalence of IBD is expected to increase further due to early age of onset and low mortality of IBD patients. Hospitalization rates in Europe are high but are slowly decreasing in patients with Crohn's disease with about 50% of patients requiring hospitalization within 10-years from diagnosis. This may vary significantly between countries. The rates of hospitalization for patients with Ulcerative colitis remained stable and reflect disease severity and risk for colectomy [12].

According to epidemiological studies in Iceland there was a statistically significant increase in both Crohn's disease and Ulcerative colitis from 1950 to 1994. In the early 1990s the incidence of Ulcerative colitis was found to be 16.5 per 100,000 and for Crohn's disease 5.5

per 100.000 [13]. In 2010 the incidence rates of IBD in Iceland had increased to 28.7 per 100,000 [14].

Social consequences of IBD

Work ability and IBD

IBD has an important impact on people's life both socially and when it comes to work ability. There appear to be a correlation between severity of IBD and the effect on the individual's ability to work. An impact survey was done 2010-2011 by the European Federation of Crohn's and Ulcerative Colitis Associations (EFCCA) in partnership with the European Crohn's and Colitis Organization (ECCO) called „The True Impact of IBD“. In total 4990 respondents were included and 10% of the respondents were underemployed and 8% unemployed due to IBD. Only about half of the respondents were fully employed or 47%. IBD affects working behavior and career but 44% claimed to have lost or had to quit a job because of IBD and 52% felt that IBD had negatively affected their education. Twenty-six% of the patients that were significantly affected by IBD (with chronically active and periodic active condition) had more than 25 days of absence in one year due to IBD and 56% of underemployed respondents worked only part-time [15].

Social life and IBD

When it comes to social life, 53% of the respondents reported that during relapse they were more likely than not to cancel or reschedule an appointment or meeting because of their symptoms. Participants aged 19-34 were the most likely to change their plans along with those who were unemployed, under-employed or disabled [15]. There are many things that can affect the symptoms of this disease and therefore the social life of these patients. A new study demonstrates that even aircraft travel and journeys to regions at an altitude of >2000 m above sea level are risk factors for flare-ups occurring within 4 weeks of travel [16].

Stress and sleep disorders

A cross-sectional prospective study done on 875 IBD patients demonstrates that patients with IBD have poorer health-related quality of life (HRQOL) than the general population [17].
HRQOL is a broad multidimensional concept that includes subjective evaluations of both positive and negative aspects of life. It is a self-reported measure of physical and mental health [18]. High levels of anxiety, depression, and stress were found to be associated with

low levels in all quality of life measurements in these patients. HRQOL should be considered in the management of these patients as stress, anxiety and depression are important determinants of HRQOL [17]. Psychological stress and intestinal permeability have been implicated in the pathophysiology of both IBD and IBS. Acute psychological stress increases small intestinal permeability in humans as peripheral corticotropin-releasing hormone (CRH) reproduces the effect of stress and disodium cromoglycate (DSCG) blocks the effect of both stress and CRH, which suggest the involvement of mast cells. Stabilization of mast cells and CRH receptors antagonists could therefore be an interesting option for the treatment or prevention of stress-related exacerbations of functional and organic GI disorders [19].

Sleep disorders in IBD patients is most likely controlled by several factors. If the disease is active the persistence of symptoms like abdominal pain can result in sleep disturbance. The medication used for IBD such as corticosteroids or narcotics may also affect people's sleep as well as the associated anxiety and depression [20]. Ananthakrishnan et al. analyzed data from 3173 patients and concluded that sleep disorder is associated with an increased risk of disease flares in Crohn's disease but not in Ulcerative colitis. This could indicate that the evaluation and treatment of sleep disorders in patients with CD might improve their symptoms [21].

Diet and risk of IBD

Diet high in fat and protein but low in fruit and vegetables, or so called “Western diet” has been suggested as possible explanation for the recent increase in IBD incidence. Higher consumption of vegetables, fish and nuts has been associated to a lower risk of CD in children [22]. A recent systematic review of total of 19 studies evaluated the association between pre-illness intake of nutrients (fats, carbohydrate and protein) and food groups (fruits, vegetables and meats) on the risk of developing IBD. High intakes of total fats, polyunsaturated fatty acids, omega-6 fatty acids and meat were associated with an increased risk of both Ulcerative colitis and Crohn's. There was no consistent association between total carbohydrate intake and IBD risk but high vegetable intake was associated with reduced risk of UC and fiber and fruit intake were associated with reduced risk of CD [23]. Incidence of Crohn's disease has increased in Japan which has been associated with increased dietary fat intake. A case-control study done in Japan in 2005 demonstrated that higher intake of sugars and sweeteners, fats and oils and fish and shellfish were associated with an increased risk of Crohn's disease. Higher consumption of fruits and vegetables only slightly decreased the risk of Ulcerative colitis but a higher intake of vitamin C (highly concentrated in fruits and vegetables)

decreased the risk. Vitamin E was found to be a risk factor for Crohn's but vitamin E is found in vegetable oils and fatty foods [24].

Body composition and nutritional status

Body composition can change as a consequence of IBD. In more than half of the CD and UC patients a depletion of muscle mass was detected in a recently published study. Fat mass depletion (36% for both CD and UC) was significantly associated with active phase disease [25]. Valentini et al. found out that patients with CD and UC show similar degrees of malnutrition and changes in body composition. Their body composition analysis demonstrated a significant decrease in body cell mass compared with controls and decreased handgrip strength. These alterations were seen even in patients who were classified as well nourished [26]. Nutritional status of IBD patients can already be affected negatively at the time of diagnosis. Geerling et al. measured nutritional status in recently diagnosed IBD patients. Body weight, body mass index and serum concentrations of several nutrients (beta-carotene, magnesium, selenium and zinc) were significantly lower in UC patients compared with controls. The intakes of protein, calcium, phosphorus and riboflavin were significantly lower in UC patients compared with controls. The authors concluded that it needs to be elucidated whether nutritional supplementation in recently diagnosed IBD patients may improve the clinical course of the disease [27].

Patients with IBD should routinely have their BMI measured [3] as the prevalence of protein-energy malnutrition has been reported to be in 20-85% of IBD patients [28]. The prevalence of malnutrition according to BMI has decreased over the years as recent studies have shown better results or only 14% in CD patients and 5.7% in UC patients [25]. Weight loss has been regarded as a predominant feature as it occurs in about 80% of CD patients and in 18-62% of UC patients. However these numbers are from studies performed among hospitalized patients and/or patients with active disease [29].

Nutrition in IBD

After diagnosis of IBD the disease process can lead to many nutritional challenges, both during remission and relapses. Nutrient malabsorption, decreased dietary intake, weight loss and increased nutritional requirements are an example of nutritional challenges people has to face. Other challenges can be anemia, macro- or micro nutrient deficiencies, osteoporosis and electrolyte losses. It is important that patients receive appropriate dietary advice soon after

diagnosis but the access to dietetic services is often limited in the health care [3]. In a UK IBD service standards it is recommended that all patients with IBD should have access to a dietitian [30].

During remission a rich and varied diet should be recommended for all patients with IBD. Diet that includes fruit and vegetables, meat, olive oil and fish is recommended and there is no reason to restrict insoluble fiber in the diet except in the case of significant intestinal stenosis. Dairy products are especially recommended for these patients because of their calcium content and milk should only be restricted in the case of lactose intolerance. Then it should be substituted by other fermented products or calcium enriched soya based products [31].

It is important to screen for nutritional deficiency, especially in inpatients. When possible, replacement or support should be given enterally. Enteral nutritional treatment is effective for induction and maintenance of remission in CD but in UC it has no disease-modifying role. Dietary modifications can help patients to reduce symptoms and predominantly in Crohn's disease [32]. Total Parenteral Nutrition (TPN) represents a therapeutic modality that could save the life of a patient with IBD who is facing severe nutritional problems, by restoring his impaired nutritional status and allowing his bowel to rest. However enteral nutrition (EN) should be the first choice for all patients having anatomically intact and functionally normal digestive tract and TPN does not compete with EN [33].

The microflora and probiotics

The understanding of the microbial involvement in IBD pathogenesis has increased over the past years with a great amount of publications on this subject [34-36]. It is thought that interactions among the immune system, the commensal microflora and the host genotype underlie the pathogenesis of IBD [35] and that the gut microflora plays a crucial role in triggering, maintaining and exacerbating IBD [36]. In patients with IBD, the enteric microflora becomes aberrant, with normal microflora decreased such as Lactobacillus and bifidobacterium and pathogenic or potentially harmful bacteria increased [37].

Probitotics are live nonpathogenic bacteria or bacterial components and the suggested mechanism of action of probiotics in IBD is the alteration of microbial diversity through competitive inhibition of other pathogenic enteric bacteria growth and improvement in epithelial and mucosa barrier function through the production of short chain fatty acids [34, 38]. Also it includes the alteration of immunoregulation and downregulation of

proinflammatory cytokines secretion. Clinical trials have documented remission in patients with UC and prevention of post surgical recurrence of CD with the use of probiotics [38]. As none of the medications and treatments used in IBD is effective in all patients, a selective manipulation of the microflora can be an additional therapeutic strategy for the treatment of the disease and maintenance of remission presenting a treatment option with a low side-effect burden [39]. The most common probiotics used in the treatment of IBD have been Lactobacillus sp, Bifidobacterium sp, E. coli Nissle 1817 and the combination VSL#3 [34].

Diet and symptoms of IBD

It can be very difficult to find out what foods and beverages stimulate GI symptoms in a patient. Many patients are unable to determine which foods bother them and it is therefore critical for the dietitian/clinician to learn how to take a food intolerance history [40]. Some of the answers to open-ended questions in diet questionnaires suggest that CD patients often avoid certain foods, based not upon their own recognition of adverse symptoms but upon advice given externally [41]. Studies have been done where patients are asked to respond on what food items they believed to ameliorate or exacerbate symptoms. Foods and beverages that induced symptoms were milk and milk containing products, caffeine, alcohol, fruit, fruit juices, spices, diet -beverages, -foods, -candies and gum, fast foods, fried foods, multigrain and sourdough breads, salads, vegetables, beans, red meats, stews, nuts, popcorn, cookies and cakes. The types of foods and beverages that are better tolerated include water, soya and goat's milk, yogurt, bananas, rice, plain pasta, baked or broiled potatoes, white breads, plain fish, chicken, watermelon, boiled or canned fruits and vegetables, margarine, jams and peanut butter [40-42]. For some food items, the same item that was beneficial for one group of patients was detrimental to others. Because of this it is very difficult to identify a specific group of food items that should be avoided by all patients and personalized diets is especially important to these individuals [41].

FODMAP diet

It has been hypothesized that Crohn's disease patients are susceptible to an excessive delivery of highly fermentable but poorly absorbed short chain carbohydrates and polyols (FODMAPs- Fermentable Oligo-, Di- and Mono-saccharides and Polyols) to the distal small intestinal lumen and colonic lumen. The rapid fermentation of FODMAPs in the distal small and proximal large intestine leads to increased intestinal permeability, a predisposing factor to

the development of Crohn's disease. FODMAPs include fructo-oligosaccharides (wheat, onions, legumes), lactose (milk, ice-cream), fructose (apples, honey), galactans (legumes) and sorbitol (stone fruits, artificial sweetener) [43]. It has been demonstrated that FODMAPs induce symptoms and increase the production of gases associated with fermentation. In patients with Irritable bowel syndrome (IBS) or other functional gut disorders, dietary studies have revealed that limiting the intake of FODMAPs results in improvement of symptoms in more than 50% of the patients [44-46]. In a dietary intervention on patients with IBD, focusing on reduction of FODMAPs, there was a durable improvement in symptoms in the majority of patients suggesting that a reduction in dietary FODMAPs is an effective therapeutic option in these patients [47].

Micronutrient deficiency in IBD

Micronutrient deficiency in IBD is common but in most cases it does not tend to have any evident clinical manifestation except with regard to iron, folic acid and vitamin B12 [28].
Both iron deficiency and anemia of chronic disease are frequently encountered in IBD. This is due to the chronic loss of blood from the intestinal tract and/or inadequate uptake of iron. The associated anemia is clinically important and can affect quality of life [48]. Iron deficiency is considered the commonest micronutrient deficiency, reported in up to 39% of IBD patients [49] and with up to 65% of patients requiring iron replacement over the course of their disease [50].

IBD and osteoporosis

Patients with Crohn's and Ulcerative colitis are at risk of developing metabolic bone disease as high prevalence of osteoporosis has been reported among these patients [51-54]. Metabolic bone disease and fragility fractures are increased in patients with IBD and the incidence of fracture among persons with IBD is 40% greater than in general population [55]. Several mechanism may contribute to skeletal abnormalities in IBD patients, but the inflammation and inflammation mediators such as TNF, IL-β and IL-6 may be the most critical [56]. The main pathogenic factors involved in osteoporosis are malabsorption, glucocorticoids treatment and increased cytokine production (inflammation) [57]. Factors associated with increased risk of osteoporosis in IBD are low body mass index, early disease onset, high corticosteroid doses and Infliximab therapy or anti-tumor necrosis factor α (TNFα) therapy. The authors conclude though that the lower T scores in patients on

Infliximab therapy is because of more severe inflammation in those patients, which is associated with elevated osteoclastogenic factors, rather than side-effect of the therapy [58]. In a study done in 2007, patients with IBD who had received Infliximab treatment were compared with patients who had never received Infliximab treatment. The suppression of TNFα with Infliximab treatment showed a beneficial effect on lumbar bone mass and bone mineral density. Therefore the authors suggest that TNFalpha plays an important role in bone loss in Crohn's disease [59]. Another study on BMD shows that age-matched BMD is higher with increasing duration of disease remission. Bone mineral density (BMD) relative to the age standardized mean (Z-score) was measured at the left femoral neck and lumbar spine in patients with IBD. Patients in remission had significantly higher mean Z-scores at the lumbar spine than patients with active disease [60]. In an Indian research from 2008, BMD was measured in patients with IBD, and two thirds of the patients had low BMD. The intake of dietary calcium was inadequate in majority of these patients [61]. It has been shown that the use of calcium and vitamin D supplements has a positive effect on bone health in IBD. Siffledeen et al. did an intervention study on 154 Crohn's disease patients who had decreased BMD. Their conclusion was that daily supplementation with vitamin D and calcium was associated with increased bone mineral density [62]. In a review from 2008 the authors state though that vitamin D and calcium is insufficient to inhibit bone loss in many patients requiring use of glucocorticoids and only biphosphonates are effective for these patients [57]. Guidelines for the prevention and treatment of osteoporosis in IBD were published in 2000 by the British Society of Gastroenterology. In these guidelines it is recommended that patients with IBD should be encouraged to achieve adequate calcium intakes or 1500 mg/day and use calcium supplements if necessary, in prevention and treatment of osteoporosis. If vitamin D deficiency is present it should be treated and for patients receiving systemic corticosteroids they recommend 20 µg of vitamin D to be given concurrently. Along with these measures, lifestyle advice such as regular weight-bearing exercise, avoiding smoking and excessive alcohol consumption is recommended. The use of corticosteroids therapy should also be limited [63]. Sapone et al. consider that BMD screening should be considered for all patients with CD and especially for those with extensive disease, multiple resections and malnutrition [57].

Dairy products and lactose intolerance

Restriction of dairy products is common among IBD patients. In a cross sectional study done on 65 patients with IBD, 65% reported restricting dairy products. Among the patients that reported restricting dairy products the frequency of gastrointestinal symptoms was higher, disease activity was more frequent and extensive disease was more common than in those with no restriction [64]. The restriction of dairy products among IBD patients could be caused by the fact that many patients experience severe symptoms after the consumption of dairy products in the absence of lactose intolerance. Appropriate dietary modifications are necessary in these situations with the replacement of milk with skimmed or lactose-free alternatives or with soy or rice based products [40].

When patients state that they are „dairy sensitive“ it can be related to lactose intolerance or malabsorption, allergy to milk proteins or the misconception that dairy products can be detrimental to their health. Actually, lactose intolerance is more common than would be expected in IBD patients even when ethnicity is taken into account [65]. It has been reported in up to 70% of IBD patients which is much higher proportion than previously thought [66].

Calcium

The recommended intake for calcium is 800 mg per day [67, 68]. Calcium is essential for good bone health and is well recognized to be an important factor to achieve optimal peak bone mass [69]. The main sources of calcium in a usual Western and Nordic diet are milk and dairy products. Other sources of calcium are fish and fish products, pulses, nuts, seeds and green vegetables [67, 69]. Pharmaceutical calcium supplements and/or dietician's advice should be considered if dietary preferences or lactase deficiency restrict consumption of dairy foods [70]. In a recent study, the dietary intake of calcium in IBD patients was investigated. The intake was lower in patients believing that consumption of lactose containing food induced symptoms, versus those who did not. Compared to healthy controls the diet in IBD patients contained significantly less calcium than in healthy controls and inadequate calcium intake was present in one third of IBD patients. The single major determinant of low calcium intake is self-reported lactose intolerance, leading to dietary restrictions [71].

Vitamin D

The recommended intake for vitamin D is 15 µg in Iceland [72] and 10 µg in the Nordic Nutrition Recommendations 2012 [73]. The important dietary sources of vitamin D are oily

fish and edible fats [73] along with fish oil [72]. Vitamin D deficiency is a recognized problem in Northern countries and supplementation for most of the year is necessary to maintain adequate vitamin D status [74, 75]. In recent years the recognition for adequate vitamin D status for optimum bone health has increased. Vitamin D may have a calcium-sparing effect and vitamin D sufficiency may be more important than high calcium intake in maintaining calcium homeostasis [75]. Vitamin D deficiency can cause rickets in children and osteomalacia in adults. It is also associated with an increased risk of osteoporosis and falls. Along with association on bone health, vitamin D may play a role in reducing risk of certain cancers, autoimmune diseases such as inflammatory bowel diseases and hypertension [74]. Vitamin D deficiency has even been suggested to contribute to the overall inflammatory state because of its diverse role in modulating the immune response [76].

Among IBD patients an inadequate intake of vitamin D (36%) and calcium (23%) has been reported [49]. Suboptimal stores of vitamin D in patients with IBD has been noted and lower serum levels of 25-hydroxyvitamin D (25-OHD) concentrations have been associated with longer disease duration, higher Crohn's Disease Activity Index, worse nutritional status, smoking and small bowel resection [77]. A clinical trial has been conducted where patients with Crohn's disease were assigned to receive either placebo or 30 µg of vitamin D. Serum vitamin D levels significantly increased and fewer relapses were reported in those patients who received vitamin D supplementation [78].

Omega-3 and IBD

In general, omega-3 fatty acids have been suggested to be beneficial in chronic inflammatory disorders such as IBD for its anti-inflammatory effects. However, results from various studies have been conflicting but a recently published meta- analysis shows a very small benefit. Omega-3 fatty acids are considered safe but probably ineffective for maintenance of remission in CD [79-81].

3. METHODS

Methods and material related to the analysis and participants in my thesis are described in detail in the manuscript (see chapter 4). In this chapter the main methods will be outlined and author's contribution will be described.

Author's contribution

1. Preparation and applications regarding the study

My contribution to the study was initiated in January 2013. The first thing to do was to compose and turn in an application to the National Bioethics Committee and to the Data Protection Authority. Permissions were received in March 2013. Information letter for the participants and informed written consent was prepared and the questionnaire was composed in cooperation with the masters committee.

2. Data collection

The collection of data was initiated in April 2013 and ended in January 2014. Most of the data collection took place in Landspítali-The National University Hospital of Iceland in cooperation with the nurse Sigríður Erla Jóhannsdóttir. About 1-3 patients with IBD come there every day to receive Remicade treatment. I informed each patient about the study, collected submissions and presented them with the questionnaire. Finally I made the body composition measures and informed them about how to fill out the three day weighed food record. The blood samples were collected by Sigríður Erla Jóhannsdóttir or other nurses giving the participants the Remicade infusion. In October I organized an open house in coordination with the Crohn's and Colitis Ulcerosa organization in Iceland in order to get some participants who were not receiving the Remicade treatment.

3. Data processing, writing of the manuscript and thesis

All the data from the questionnaire (along with the body composition measures) was entered into SPSS as soon as each participant had answered them. The food records were entered into excel as soon as the participants had delivered them. The results from the blood samples were retrieved from Saga, the medical record program of the hospital every couple of months for many participants at a time. After running the food records in the nutrient calculating program ICEFOOD, all the data was put together into SPSS. Statistical analysis presented were made

with supervision from Alfons Ramel. In February 2014 I participated in the annual educational day of the Faculty of Food Science and Nutrition, University of Iceland and presented a short overview and poster on the project. At last a draft of the manuscript *"Dietary intake and nutritional status of inflammatory bowel disease patients"* and the thesis was written.

4. MANUSCRIPT

Dietary intake and nutritional status of inflammatory bowel disease patients

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The study was approved by the Science Ethical Commitee in Iceland and by the Icelandic Data Protection Commission.

Abstract

Background and aims: Inflammatory bowel disease (IBD) can lead to many nutritional problems. The aim of this study was to investigate diet and nutritional status of IBD patients.

Methods: A total of 78 participants (35 men and 43 women aged 18-74 years) were included in this cross-sectional study, the majority (80%) receiving infliximab treatment. Participants filled out disease related questionnaires and a 3-day food record. Body composition was measured and blood samples were analysed in order to estimate nutritional status.

Results: The majority (87%) claimed that diet affects disease symptoms and 72% had changed diet accordingly. The most common foods restricted were dairy products (60%), processed meat (55%), soft drinks (46%), alcohol (45%) and fast food (44%). Body mass index was mostly in the overweight range (BMI= 25-29.9) but 46% of the participants had been diagnosed with some nutritional deficiency since IBD diagnosis (most common iron deficiency: 39%). Patients who restricted meat products had lower ferritin values (47.5±38.6 vs. 95.1±73.5µg/L, P=0.011). Intakes of vitamin D and calcium were not adequate (65% below recommeded intake for both) and 60% had poor vitamin D status.

Conclusion: IBD patients often change their dietary intake in order to affect disease symptoms. Many patients have a history of nutrient deficiency. Restriction of dairy and meat intake is common and can negatively influence intakes or status of micronutrients like calcium and iron. Dietary advice by a dietitian and use of potentionally helpful dietary supplements is indicated.

Keywords: inflammatory bowel disease, dietary intake, nutritional status

BACKGROUND

Inflammatory bowel disease (IBD) is an inflammatory condition of the colon and small intestine and the major types are Crohn's disease (CD) and Ulcerative colitis (UC) [1]. Millions of people around the world suffer from these diseases but the etiology and pathogenesis remain to be elucidated [2, 3]. After diagnosis of IBD the disease process can lead to many nutritional challenges, both during remission and relapses. Decreased dietary intake, nutrient malabsorption, macro- or micronutrient deficiencies, weight loss and osteoporosis are some of the nutritional challenges people have to face.

Patients usually associate certain foods or food groups with disease symptoms and therefore they avoid certain types of foods and beverages. As a consequence, studies have been conducted to find out what food types induce symptoms in patients [4, 5]. However, this has been difficult [4], as some food items can be beneficial for one patient and detrimental to another. It is not possible to identify a specific group of food items that should be avoided by all patients and personalized diets is especially important to these individuals [6]. As patients avoid many food groups it is reasonable to assume that many patients might have some nutritional deficiency.

Micronutrient deficiency in IBD is common but in most cases it does not tend to have any evident clinical manifestation except with regard to iron, folic acid and vitamin B_{12} [7].

Iron deficiency is considered the commonest micronutrient deficiency, reported in up to 39% of IBD patients [8] and with up to 65% of patients requiring iron replacement over the course of their disease [9]. Vitamin B_{12} deficiency appears to be common in patients with ileal CD or resection of the ileum [10] and prevalence of subnormal levels of vitamin B_{12} has been reported in 18% of IBD patients [8].

Restriction of dairy products seems to be quite common among IBD patients or up to 65% [11]. Inadequate calcium intake has been reported in one third of patients [12] along with

inadequate intake of vitamin D (36%) [8] and low serum vitamin D concentrations [13]. Osteoporosis has been reported among these patients [14-18] and fracture among patients with IBD is 40% greater than in general population [19].

In order to gain more knowledge on IBD and diet, the aim of the present study was to investigate dietary intake, food preferences and nutritional status of Crohn‘s disease and ulcerative colitis patients in Iceland.

METHODS AND MATERIAL

Participants and study design

This cross-sectional study included 78 patients (35 men and 43 women aged 18-74 years) with the diagnosis of either Crohn's disease or ulcerative colitis. The data collection was carried out from April 2013 to January 2014. The participants were recruited by advertisements from all over Iceland but most of them were from Reykjavik capital area. Most of the participants (n = 62) were on infliximab therapy receiving infusion every five to eight weeks. The rest of the participants (n = 16) used other IBD drugs or no medicines at all. The study was approved by the Icelandic National Bioethics Committee and all persons gave their informed consent prior to their inclusion in the study.

Questionnaire

All the participants answered a detailed questionnaire which contained 65 questions about the disease, symptoms, medications, allergies, supplementations, diet and food preferences.

Body composition measures

Body weight was measured on a calibrated scale (model no. 708, Seca, Hamburg, Germany) and height was measured with a calibrated stadiometer (model no. 206; Seca, Hamburg, Germany). Body mass index (BMI) was calculated from the recorded height and weight. Waist circumference was measured halfway between the top of the lateral iliac crest and the lowest rib. Body fat% was assessed by bioelectrical impedance analysis (Body Fat Monitor BF 306, Omron Healthcare UK Ltd, Milton Keynes, United Kingdom).

Blood samples

Blood samples were taken by the nurses in the hospital when the participants received infliximab infusion. The blood values used in the present study were hemoglobin, albumin, C-reactive protein (CRP), iron, total iron binding capacity (TIBC), ferritin, vitamin B_{12}, folate

and vitamin D. Blood samples were not available from patients that used other IBD drugs than infliximab or no medicines at all.

Dietary assessment

The participants recorded intake of all food and drinks (and supplements) during three days including one weekend day. The data was transferred into a nutrient calculation program, ICEFOOD version 2.0 which is based on nutritional composition values on 514 ingredients from the Icelandic nutrient composition database ISGEM and 607 food recipes from the Directorate of Health. The average intake of three days for each participant was calculated.

Data analysis

Statistical analyses were performed using SPSS 20 (SPSS Inc., Chicago, IL, USA). Data are described as mean ± standard deviation (SD) or as median and inter-quartile-range (IQR). Data were checked for normal distribution using the Kolmogorov-Smirnov test. An independent samples t-test (normal distribution) or a Mann–Whitney U test (non-normal distribution) were used to assess the difference between two groups. The level of significance in the study was $P<0.05$

RESULTS

Table 1 shows the characteristics of the participants. The mean BMI for both genders was in the overweight range (BMI= 25-29.9), only one man (2.9%) and one women (2.3%) were with a BMI below 18.5 kg/m^2 and 20% of the participants were in obesity range (BMI>30). The majority of the participants had changed their diet in course of the disease and also the majority claimed that diet affected disease symptoms. Foods and beverages most frequently claimed to have negative effects on symptoms and thus avoided were dairy products (60%), processed meat (55%), soft drinks (46%), alcohol (45%), fast food (44%), spicy food (41%), citrus fruits (41%), cabbage (26%), meat (26%) and coffee/tea (36%). Foods that were mentioned to have positive effect on symptoms were fish (22%), non processed food (8%), chicken (6%), and nutritional drinks (6%). Fruits and vegetables were both mentioned to have negative and positive effects but slightly more people find it negative or 16.5% vs. 13.5%.

The use of dietary supplements among participants is shown in Table 2. Cod liver oil and vitamin D supplements were the most commonly used supplements. Although 47 patients (60%) reported to consume less or even no dairy products, only 8 of them used calcium supplements. Dietary calcium intake of 72% of those who consumed less or even no dairy products did not reach the recommendation.

Almost half of the participants (46%) had been diagnosed with a nutritional deficiency after their diagnosis of CD or UC. Iron deficiency was the most frequent deficiency (39%) which tended to be more frequent in women than men (49 vs. 26%, P = 0.06). Diagnoses of deficiency of vitamin B_{12} (17%), vitamin D (4%) and folic acid (1%) were less common.

Table 3 shows the participants' dietary intake in comparison to the Nordic Nutrient Recommendation 2012 [20] and to results from the National Survey from 2011 [21]. Only 31 participants returned the 3-day food record. A look at the micronutrient and vitamin intake shows that intakes were below recommended levels, especially true for women. E.g., 65% of

the participants had a calcium intake below 800 mg/d and 16% even below 400 mg/d. When the daily intake of vitamin D was examined we found out that 65% did not reach the Icelandic recommendations and 29% were even below 2.5 µg/d, which is the lower level of intake for vitamin D. Seventy-seven% of women did not reach the recommended daily intake of iron. Vitamin B_{12} intake however was sufficient, but participants who reduced intake of milk products had less intake of vitamin B_{12} (4.7 ± 3.0 vs. 9.4 ± 8.2 µg B_{12}/day, P = 0.042).

In Table 4 blood values of the participants are listed. Women were more often below reference values in various iron indices (iron: 22% vs. 3%, P =0.06); ferritin: 18.5% vs. 0%, P = 0.009). Participants who reduced meat intake in course of their disease had lower blood values of ferritin compared to others (47.5 ± 38.6 vs. 95.1 ± 73.5, P = 0.011). This difference was still significant after correction of gender.

Although only the minority of participants had received a diagnosis of vitamin D deficiency previously (see above), the measured vitamin D concentrations were low and 60% of the participants were below 50 nmol/L and 26% even below 30 nmol/L. Participants taking vitamin D supplements had significantly higher blood values than the ones not taking any (70.6 ± 40.5 vs. 41.8 ± 21.2 nmol/L, P = 0.007). There was not a clear association between vitamin D status and weeks of the year and no association between intake of cod liver oil and vitamin D status.

Participants that took vitamin B_{12} supplements had significantly higher vitamin B_{12} blood values than the ones not taking any (505±215 vs. 361±99 pmol/L, P = 0.001).

DISCUSSION

Our study on dietary intake and IBD shows that patients associate certain food groups to IBD symptoms. The great majority of the participants (87%) claim that diet can affect symptoms and 72% have changed their diet accordingly after they were diagnosed with IBD. The most common food groups mentioned to worsen symptoms were dairy products, processed meat, fast food, soft drinks, alcoholic beverages but also citrus fruits and cabbage. However, due to inter-individual variability, i.e., some foods were mentioned as having both negative as well as positive effects on the disease, it is very difficult to give general dietary advice for this patient group.

As body composition can change as a consequence of IBD, patients with IBD should routinely have their BMI measured [22] as the prevalence of protein-energy malnutrition has been reported to be in 20-85% of IBD patients [7]. Interestingly, the prevalence of malnutrition according to BMI has decreased over the years as recent studies have shown lower prevalence rates in IBD patients [23] which may be related to better therapy. In our participants BMI was most often even in the overweight range and the reported mean intakes of macronutrients (E%) were comparable to the results from the National Survey and in line with the recommendations, with the exception of carbohydrates, which delivered less than 45% of energy. Although energy intake of the participants seems to be satisfying, both in terms of BMI and estimated intake of macronutrients, nearly half of the participants (46%) have been diagnosed with some nutritional deficiency during their history of IBD. According to literature, micronutrient deficiency in IBD is common but in most cases it does not tend to have any clinical manifestation except with regard to iron, folic acid and vitamin B_{12} [7].

In general, patients with IBD are at greater risk of developing metabolic bone disease as high prevalence of osteoporosis has been reported among these patients [14-17]. In our study more than half of the participants restrict their intake of dairy products which is similar to recently

published findings from Lopes et al [11]. Thus, not surprising, dietary calcium intake is inadequate in this group and 72% did not achieve recommended intakes. Unfortunately, only 15% of those who restricted their dairy intake took calcium supplements. Another important nutrient to ensure good bone health is vitamin D. An intervention study showed that use of calcium and vitamin D supplements has a positive effect on bone health in IBD [24] and patients with low BMD and low calcium intake are advised to increase the intake of dairy products to prevent osteopenia and osteoporosis [18]. Forty-one percent of our participants used vitamin D supplements and these individuals had significantly higher 25OHD concentrations than those who did not take supplements. Even more frequently (62%) cod liver oil was used on a regular basis. This is higher than the numbers from the National Dietary Survey (2010-2011), where only 43% of adults in Iceland took cod liver oil [21]. However, there was no significant association between intake of cod liver oil and vitamin D status indicating that amount or frequency of cod liver oil used were not sufficient. Inadequate uptake of micronutrients from the intestinal tract has also been discussed in IBD patients [25]. Nearly two thirds of the patients had 25OHD below the lower threshold of 50 nmol/L. Considering this low intake of dairy products along with low serum vitamin D levels, more supervision and education/guidance to the patients in order to reduce the risk osteoporosis can be considered as beneficial.

Iron deficiency has been detected in 39% of the participants (49% in women) since the diagnosis of IBD. This is in accordance with previous studies which reported iron deficiency the most common micronutrient deficiency reporting a prevalence of up to 39% in IBD patients [8] and with up to 65% of patients requiring iron replacement over the course of their disease [9]. The associated anemia is clinically important and can affect quality of life [25]. Despite the high prevalence of iron deficiency in IBD, only 15% of our participants take iron supplements. Interestingly, iron intake was not significantly different between patients who

restrict meat and meat products and those who did not, however, ferritin values were significantly lower in those who did not eat meat. It is well known that iron bioavailability from meat is usually better than from plant sources [26]. Women have increased needs of iron during childbearing years due to menstrual bleeding [27] and as IBD patients have often inadequate uptake of iron [25] it is especially important for women with IBD to mind their iron status.

Dietary intake of vitamin B_{12} was high both for men and women. The participants who reduced intake of milk products had lower intake of vitamin B_{12} than those who did not reduce milk intake but still higher than the recommended intake. Mean vitamin B_{12} levels in blood were well above the recommended minimum.

Limitations

This study was of cross-sectional nature and thus cannot differentiate between cause and effect in an observed association. Further on, we used subjective information from patients, e.g. food groups and disease symptoms, which cannot be considered to be firm scientific data to prove a relation between e.g., milk and symptoms. Rather we used this information to detect potential nutrition related problems, e.g., poor calcium intake, derived from avoidance of certain food groups.

Conclusion

Our study shows that IBD patients often change their dietary intake in order to affect disease symptoms. Many patients have a history of nutrient deficiency. Restriction of dairy and meat intake is common and can negatively influence intakes or status of micronutrients like calcium and iron. Dietary advice by a dietitian and use of potentionally helpful dietary supplements is indicated.

***Conflict of Interest**:* The authors declare no conflict of interest.

***Acknowledgements**:* The authors want to give their best thanks to Sigriður Erla Jóhannsdóttir for her help in collecting the data and provide information about the patients in order to meet them. To all the participants we are very grateful for participating and being so positive and enthusiastic about the research. Also we want to thank the Crohn's and Colitis organization in Iceland for their help in organizing an open house to collect data from the participants not receiving infliximab.

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Table 1 Characteristics of the participants.

	All (N=78)	**Male (n=35)**	**Female (n=43)**
Age	40 ± 12.7	39 ± 10.8	41 ± 14.0
Height (cm)	172.8 ± 8.7	179.3 ± 6.9	167.5 ± 5.9
Body Weight (kg)	79.2 ± 16.4	82.1 ±16.1	76.9 ± 16.5
BMI (kg/m^2)	26.5 ± 5.4	25.5 ±4.6	27.4 ± 5.9
Waist (cm)	92.6 ± 13.3	93.3 ±11.6	92.2 ± 14.6
Body fat%	29.4 ± 9.9	22.4 ±7.8	36.2 ±6.4
Crohn's disease	43 55%	22 63%	21 49%
Ulcerative colitis	35 45%	13 37%	22 51%
Disease symptoms	32 41%	13 37%	19 44%
Infliximab/Adalimumab	65 83%	35 100%	30 70%
Stress increases symptoms	58 74%	26 74%	32 74%
Insomnia increases symptoms	40 51%	20 57%	20 47%
Food Allergy	6 8%	1 3%	5 12%
Food Intolerance	15 19%	5 14%	10 23%
Have met a dietitian	32 41%	13 37%	19 44%
Smokers	16 21%	9 26%	7 16%
Smoked before diagnosis	28 40%	15 43%	13 30%

Data are presented as mean and SD or N and %
Abbreviations: BMI- body mass index, SD- standard deviation

Table 2 Current intake of supplements among participants.

	All (N = 78)		**Male (n = 35)**		**Female (n = 43)**	
Cod liver oil	48	62%	23	66%	25	58%
Vitamin D	32	41%	11	31%	21	49%
Multivitamin	21	27%	6	17%	15	35%
Vitamin B-12	14	18%	5	14%	9	21%
Calcium	12	15%	3	9%	9	21%
Iron	12	15%	2	6%	10	23%
Probiotics	10	13%	3	9%	7	16%
Other Medicine	27	35%	7	20%	20	47%
Herbal Medicine	8	10%	3	9%	5	12%
Medicinal Cannabis[a]	5	6%	4	11%	1	2%

Data are presented as N and %

[a] Have ever used medicinal Cannabis to relieve symptoms

Table 3 Mean intake of macronutrients and median intake of dairy products, calcium, vitamin D, iron and vitamin B_{12} per day.

(n = 31)	**mean ± SD**	**%E**	**Recomended %E[a]**	**National survey 2012[b]**
Energy (kcal)	1860 ± 715			2059 kcal
Protein (g)	87 ± 36.0	19%	10-20%	93 g (18%)
Fat (g)	73 ± 32.8	35%	25-40%	83g (36%)
Carbohydrates (g)	195 ± 82.1	42%	45-60%	216 g (42%)
Fibre (g)	17.5 ± 6.7	2%	23 g	17g (1.7%)
Added sugar (g)	38.5 ± 34.7	8%	>10%	47g (9%)

	median (IQR)	**Male (n=14)**	**Female (n=17)**	**RDI[a]**	**mean ± SD**
Dairy products (g)	190 (232)	218 (550)	133 (95.3)	-	300 ± 232
Calcium (mg)	717 (302)	877 (718)	674 (204)	800	923 ± 428
Vitamin D (µg)	6.5 (18.6)	13.1 (17.3)	4.3 (13.2)	10/15[c]	8.1 ± 9.3
Iron (mg)	10.8 (8.4)	11.5 (10)	8.5 (7.5)	9[d]/15[e]	10.9 ± 5.8
Vitamin B_{12} (µg)	5.1 (5.7)	7.2 (6.7)	4.3 (4.8)	2.0	6.9 ± 8.5

Abbreviations: SD-standard deviation, %E- % of total energy, RDI- recommended daily intake

[a] According to Nordic Nutrition Recommendation 2012.

[b] According to The National Food Survey in Iceland 2010-2011.

[c] According to Icelandic recommendations- Landlæknisembættið- Ráðlagðir dagskammtar (RDS) af ýmsum vitaminum 2013.

[d] Male

[e] Female

Table 4 Blood values of the participants.

	All (N=58-64)	Male (n=32-35)	Female (n=25-29)	Reference ranges
Hemoglobin(g/L)	139.2 ± 14.2	148 ± 9.5	128 ± 11.3	134-171[a] / 118-152[b]
Albumin (g/L)	41 ± 3.7	42 ± 3.3	40 ± 3.8	36-48
CRP (mg/L)	8.3 ± 7.8	6.9 ± 5.4	10 ± 9.8	<10
Iron (µmol/L)	17.9 ± 8.1	19.6 ± 7.8	15.7 ± 8.1	9-34
TIBC (µmol/L)	61.3 ± 14.3	58.3 ± 15	64.9 ± 12.9	49-83
Ferritin (µg/L)	81.9 ± 68.8	100 ± 66.7	58.4 ± 65.2	30-400[a] /15-150[b]
Vitamin B-12 (pmol/L)	385 ± 133.8	385 ± 134	384 ± 137	210-800
Folate (nmol/L)	23 ± 10.3	23.4 ± 10	22.6 ± 10.6	6-35
Vitamin D[c] (nmol/L)	51.9 ± 32.2	47.5 ± 33	57.5 ± 30.4	50-150

Data are presented as mean and SD

Abbreviations: SD- standard deviation, CRP- C-reactive protein, TIBC- total iron binding capacity

[a] Male

[b] Female

[c] S-25-OH Vitamin D3/D2

5. CONCLUSION AND FUTURE PERSPECTIVES

It is clear that IBD is difficult to handle and is very unpredictable. It is thus even more important that IBD patients receive professional help in finding their best personal nutrition to keep down symptoms and to avoid unnecessary dietary restriction and nutritional deficiency. In our study not even the half of the participants (41%) had been to a dietitian and many people did not even know that it was the possibility to meet a dietitian at the hospital. It should definitely be a standard procedure to advice all patients who are diagnosed with IBD to see a dietitian and to introduce it to the Icelandic health care service standards.

As these results show how important IBD patients think their diet is regarding symptoms, staff at the gastroenterology ward should discuss with patients the possibility to modify their diet in order to improve symptoms. Both staff at the gastroenterology ward and patients should also be alert about the patients' nutritional status and risk for deficiency, especially regarding iron, vitamin D and calcium.

More clinical trials of vitamin D in the treatment of IBD are needed as they are very scarce but with good results. As so big part of the participants restrict their intake of dairy products and have low serum vitamin D levels there would be a reason to measure the bone mineral density (BMD) of these patients. According to Etzel et al. BMD testing and osteoporosis treatments are underutilized although osteoporosis is highly prevalent in the IBD population [52]. A study in which the BMD status and serum vitamin D level are measured would be important in Iceland and it would be interesting to compare the BMD status of the patients that restrict their dairy products intake and the ones who don't.

In our sample it was surprising that only 13% of the participants regularly took probiotics, a promising dietary component which might help to control the disease. It would be possible to do an intervention study using probiotics and perhaps compare the outcome in patients receiving Infliximab and in patients taking no medications.

As a continuation of our study, it would be possible to dig deeper into the food records, obtaining more and comparing them in greater detail to the Icelandic recommendations, the Icelandic food survey and to the symptoms and disease stage of each patient. Another cross sectional study where the background of each participant would be examined is also a fascinating option with special focus on antibiotics use in infancy.

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1 APPENDICES

1.1 APPENDIX I – Table 1. Characteristics of the participants

	All (N=78)	Male (n=35)	Female (n=43)
Age	40 ± 12.7	39 ± 10.8	41 ± 14.0
Height (cm)	172.8 ± 8.7	179.3 ± 6.9	167.5 ± 5.9
Body Weight (kg)	79.2 ± 16.4	82.1 ±16.1	76.9 ± 16.5
BMI (kg/m^2)	26.5 ± 5.4	25.5 ±4.6	27.4 ± 5.9
Waist (cm)	92.6 ± 13.3	93.3 ±11.6	92.2 ± 14.6
Body fat%	29.4 ± 9.9	22.4 ±7.8	36.2 ±6.4
Crohn's disease	43 55%	22 63%	21 49%
Ulcerative Colitis	35 45%	13 37%	22 51%
Disease symptoms	32 41%	13 37%	19 44%
Infliximab/Adalimumab	65 83%	35 100%	30 70%
Stress increases symptoms	58 74%	26 74%	32 74%
Insomnia increases symptoms	40 51%	20 57%	20 47%
Food Allergy	6 8%	1 3%	5 12%
Food Intolerance	15 19%	5 14%	10 23%
Have met a dietitian	32 41%	13 37%	19 44%
Smokers	16 21%	9 26%	7 16%
Smoked before diagnosis	28 40%	15 43%	13 30%

Data are presented as mean and SD or N and %
Abbreviations: BMI- body mass index, SD- standard deviation

1.2 APPENDIX II – Table 2. Participants that have been diagnosed with a nutritional deficiency.

	All (N=78)		Male (n=35)		Female (n=43)	
Nutritional deficiency	36	46%	13	37%	23	54%
Iron deficiency	30	39%	9	26%	21	49%
Vitamin B_{12} deficiency	13	17%	5	14%	8	19%
Vitamin D deficiency	3	4%	1	3%	2	5%
Folic acid deficiency	1	1%	0		1	2%

Data are presented as N and %

1.3 APPENDIX III – Table 3. Current intake of supplements among participants.

	All (N = 78)	Male (n = 35)	Female (n = 43)
Cod liver oil	48 62%	23 66%	25 58%
Vitamin D	32 41%	11 31%	21 49%
Multivitamin	21 27%	6 17%	15 35%
Vitamin B-12	14 18%	5 14%	9 21%
Calcium	12 15%	3 9%	9 21%
Iron	12 15%	2 6%	10 23%
Probiotics	10 13%	3 9%	7 16%
Other Medicine	27 35%	7 20%	20 47%
Herbal Medicine	8 10%	3 9%	5 12%
Medicinal Cannabis[a]	5 6%	4 11%	1 2%

Data are presented as N and %

[a] Have ever used medicinal Cannabis to relieve symptoms.

1.4 APPENDIX IV - Table 4. Changes in diet after diagnosis

	All (N=78)	
Diet affects symptoms	68	87%
Changes in diet after diagnosis	56	72%
Less/None Dairy Products	47	60%
Less/None Processed Meat	43	55%
Less/None Soft Drinks	36	46%
Less/None Alcohol	35	45%
Less/None Fast Food	34	44%
Less/None Spicy Food	32	41%
Less/None Coffee/Tea	28	36%
Less/No Meat	20	26%
Less/None Fruits	14	18%
Less/None Vegetable	12	15%
More Fish	17	22%
More Fruits	10	13%
More Vegetable	11	14%
Eat differently in relapse	41	53%

Data are presented as N and %

1.5 APPENDIX V Table 5. Foods that have negative/positive effects on symptoms.

	All (N=78)	
Negative effects:		
Citrus Fruits	32	41%
Cabbage	20	26%
Processed food	18	23%
Spicy food	10	13%
Dairy Products	9	12%
Sugar	9	12%
Bread	9	12%
Rutabaga	6	8%
Onion	5	6%
Tomatoes	5	6%
Apples	4	5%
Bananas	3	4%
Positive effects:		
Fish	15	19%
Chicken	5	6%
Nutritional Drinks	5	6%
None processed food	6	8%

Data are presented as N and %

1.6 APPENDIX VI - Table 6. Mean intake of macronutrients and median intake of dairy products, calcium, vitamin D, iron and vitamin B_{12} per day.

(n = 31)	mean ± SD	%E	Recomended %E[a]	National survey 2012[b]
Energy (kcal)	1860 ± 715			2059 kcal
Protein (g)	87 ± 36.0	19%	10-20%	93 g (18%)
Fat (g)	73 ± 32.8	35%	25-40%	83g (36%)
Carbohydrates (g)	195 ± 82.1	42%	45-60%	216 g (42%)
Fibre (g)	17.5 ± 6.7	2%	23 g	17g (1.7%)
Added sugar (g)	38.5 ± 34.7	8%	>10%	47g (9%)

	median (IQR)	Male (n=14)	Female (n=17)	RDI[a]	mean ± SD
Dairy products (g)	190 (232)	218 (550)	133 (95.3)	-	300 ± 232
Calcium (mg)	717 (302)	877 (718)	674 (204)	800	923 ± 428
Vitamin D (µg)	6.5 (18.6)	13.1 (17.3)	4.3 (13.2)	10/15[c]	8.1 ± 9.3
Iron (mg)	10.8 (8.4)	11.5 (10)	8.5 (7.5)	9[d]/15[e]	10.9 ± 5.8
Vitamin B_{12} (µg)	5.1 (5.7)	7.2 (6.7)	4.3 (4.8)	2.0	6.9 ± 8.5

Abbreviations: SD-standard deviation, %E- % of total energy, RDI- recommended daily intake

[a] According to Nordic Nutrition Recommendation 2012.

[b] According to The National Food Survey in Iceland 2010-2011.

[c] According to Icelandic recommendations- Landlæknisembættið- Ráðlagðir dagskammtar (RDS) af ýmsum vitaminum 2013.

[d] Male

[e] Female

1.7 APPENDIX VII - Table 7. Blood values of the participants.

	All (N=58-64)	Male (n=32-35)	Female (n=25-29)	Reference ranges
Hemoglobin(g/L)	139.2 ± 14.2	148 ± 9.5	128 ± 11.3	134-171[a] / 118-152[b]
Albumin (g/L)	41 ± 3.7	42 ± 3.3	40 ± 3.8	36-48
CRP (mg/L)	8.3 ± 7.8	6.9 ± 5.4	10 ± 9.8	<10
Iron (µmol/L)	17.9 ± 8.1	19.6 ± 7.8	15.7 ± 8.1	9-34
TIBC (µmol/L)	61.3 ± 14.3	58.3 ± 15	64.9 ± 12.9	49-83
Ferritin (µg/L)	81.9 ± 68.8	100 ± 66.7	58.4 ± 65.2	30-400[a] /15-150[b]
Vitamin B-12 (pmol/L)	385 ± 133.8	385 ± 134	384 ± 137	210-800
Folate (nmol/L)	23 ± 10.3	23.4 ± 10	22.6 ± 10.6	6-35
Vitamin D[c] (nmol/L)	51.9 ± 32.2	47.5 ± 33	57.5 ± 30.4	50-150

Data are presented as mean and SD

Abbreviations: SD- standard deviation, CRP- C-reactive protein, TIBC- total iron binding capacity

[a] Male

[b] Female

[c] S-25-OH Vitamin D3/D2

1.8 APPENDIX VIII - Permission from the National Bioethics Committee

VÍSINDASIÐANEFND

Hafnarhúsið, Tryggvagata 17
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netfang: visindasidanefnd@vsn.stjr.is

Alfons Ramel
Þórðarsveig 2
113 Reykjavík

Reykjavík 12. mars 2013
Tilv.: VSNb2013020007/03.07

Efni: 13-038-afg Matarvenjur og næringarástand sjúklinga með bólgusjúkdóm í meltingavegi-tengsl við sjúkdómsvirkni.

Vísindasiðanefnd þakkar svarbréf þitt, dags. 05.03.2013 vegna áðursendra athugasemda við ofangreinda rannsóknaráætlun sbr. bréf nefndarinnar dags. 26.02.2013. Í bréfinu koma fram svör og skýringar til samræmis við athugasemdir Vísindasiðanefndar og því fylgdu endurbætt gögn.

Fjallað var um svarbréf þitt og önnur innsend gögn á fundi Vísindasiðanefndar 12.03.2013.

Rannsóknaráætlunin er endanlega samþykkt af Vísindasiðanefnd.

Vísindasiðanefnd bendir rannsakendum vinsamlegast á að birta VSN tilvísunarnúmer rannsóknarinnar þar sem vitnað er í leyfi nefndarinnar í birtum greinum um rannsóknina.

Jafnframt fer Vísindasiðanefnd fram á að fá send afrit af, eða tilvísun í, birtar greinar um rannsóknina. Rannsakendur eru minntir á að tilkynna rannsóknarlok til nefndarinnar.

Áréttað er að allar fyrirhugaðar breytingar á þegar samþykktri rannsóknaráætlun þurfa að koma inn til nefndarinnar til umfjöllunar.

Jafnframt ber ábyrgðarmanni að láta stofnanir, sem veitt hafa leyfi vegna framkvæmdar rannsóknarinnar eða öflunar gagna vita af fyrirhuguðum breytingum.

Með kveðju,
f.h. Vísindasiðanefndar,

Gísli Ragnarsson, varaformaður

1.9 APPENDIX IX – Advertisement

Hefur þú áhuga á að taka þátt í rannsókn?
„Matarvenjur og næringarástand sjúklinga með bólgusjúkdóm í meltingarvegi- tengsl við sjúkdómsvirkni“

Rannsóknarstofa í næringarfræði við Landspítala og Matvæla- og næringarfræðideild Háskóla Íslands óskar eftir þátttakendum í rannsókn sem hlotið hefur samþykki Vísindasiðanefndar. Ábyrgðarmaður rannsóknarinnar er Alfons Ramel fræðimaður í næringarfræði (864-8330).

- Þátttakendur þurfa að vera með sáraristilsbólgu eða Crohn’s sjúkdóm.
- Markmið rannsóknarinnar er að kanna mataræði og næringarástand hjá sjúklingum með bólgusjúkdóma í meltingarvegi.
- Þátttaka í rannsókninni felst í því að mæta þrisvar í blóðsýnatöku, svara spurningalista um mataræði og að auki fylla út matardagbók fyrir þrjá daga. Ekki er greitt fyrir þátttöku.

Áhugasamir sem uppfylla ofangreind skilyrði eru beðnir um að hafa samband við Jónu Björk Viðarsdóttur, meistaranema í næringarfræði í síma 543-8410 eða með því að senda tölvupóst á jbv3@hi.is

Þeir sem hafa samband við rannsakendur eru eingöngu að lýsa yfir áhuga á frekari upplýsingum en ekki skuldbinda sig til þátttöku. Þátttakendur fá ekki greitt fyrir þátttökuna.Ef þú hefur spurningar um rétt þinn sem þátttakandi í rannsókninni getur þú snúið þér til Vísindasiðanefndar, Hafnarhúsinu við Tryggvagötu 17, 150 Reykjavík. Sími: 551-7100, fax:551-1444

1.10 APPENDIX X - Introduction letter for participants

Kynningarbréf fyrir þátttakendur í rannsókninni „Matarvenjur og næringarástand sjúklinga með bólgusjúkdóm í meltingarvegi-tengsl við sjúkdómsvirkni“

Kæri viðtakandi,

Fyrirhugað er að hefja ofangreinda rannsókn á vegum Rannsóknarstofu í næringarfræði sem er styrkt af Vísindasjóð Landspítala. Markmið rannsóknarinnar er að kanna mataræði og næringarástand hjá sjúklingum með bólgusjúkdóma í meltingarvegi. Mjög lítið er vitað um hvaða hlutverki mataræði gegnir og því erfitt að ráðleggja sértækt mataræði. Þessi rannsókn er hluti af námssverkefni Jónu Bjarkar Viðarsdóttur sem er í meistaranámi í næringarfræði við Matvæla- og næringarfræðideild Háskóla Íslands.

Ábyrgðarmaður rannsóknarinnar:	Alfons Ramel fræðimaður Rannsóknarstofa í næringarfræði Landspítali Háskólasjúkrahús Eiríksgötu 29, 1 hæð 101 Reykjavík

Rannsakendur

Jóna Björk Viðarsdóttir MS nemi
Rannsóknarstofa í næringarfræði
Sími: 866-7385
Tölvupóstur: jbv3@hi.is

Einar S. Björnsson meltingarlæknir
Meltingardeild Hringbraut
Sími: 543-6180
Tölvupóstur: einarsb@landspitali.is

Sigríður Erla Jóhannsdóttir hjúkrunarfræðingur
Landspítali Háskólasjúkrahús
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Inga Þórsdóttir prófessor í næringarfræði
Háskóli Íslands
Sími: 824-5520
Tölvupóstur: ingathor@hi.is

Öflun þátttakenda og þátttökuskilyrði

Þátttakendur eru sjúklingar með annað hvort sáraristilbólgu eða Crohn's sjúkdóm.

Hvað felst í þátttöku?

Þátttaka í rannsókninni felst í því að svara spurningarlista um mataræði og að fylla út matardagbók í þrjá daga í upphafi rannsóknar. Mælt verður hæð, þyngd, fituprósenta og mittisummál. Þú mætir jafnframt einu sinni á umsömdum tíma í blóðsýnatöku þar sem mælingar á blóðhag, bólguparametrum, járn og járnbindigetu, fólínsýru, B12-vitamíni og D-vítamíni verða gerðar.

Kostnaður/greiðslur

Þátttaka mun hvorki fela í sér kostnað fyrir þig né færðu greitt fyrir þátttökuna.

Áhætta og ávinningur

Niðurstöður gera mögulegt að finna út hvaða fæðuþættir valda versnun einkenna og hvaða mataræði minnkar einkenni sjúklinga með sáraristilsbólgu og Crohn's sjúkdóm. Hægt verður að meta sambandið milli fæðuinntöku og skorts á næringarefnum og með því að taka tillit til virkni bólgusjúkdómsins. Hægt verður að fá fram hvernig næringarástand hjá sjúklingum hafa áhrif á daglega líðan, auk vitneskju um eigin líkamsþyngdarstuðul og blóðgildi.
Blóðsýnataka getur valdið óþægindum en aðrar mælingar eiga ekki að valda óþægindum. Hugsanleg hætta af rannsókninni verður að teljast hverfandi.

Trúnaður við þátttakendur

Nafn þitt kemur hvergi fram, hvorki á blóðsýnum né spurningalistum og verða öll gögn ópersónutengd (kóðuð) þannig að ekki er hægt að rekja þau til viðkomandi. Farið verður að íslenskum lögum varðandi persónuvernd, vinnslu og eyðingu frumgagna og verða rannsóknargögn varðveitt á öruggum stað hjá ábyrgðarmanni á meðan á rannsókn stendur. Niðurstöðurnar verða kynntar á alþjóðlegum vettvangi og notaðar við skrif á lokaritgerð til meistaragráðu í næringarfræði við Háskóla Íslands. Lífsýni verða greind hérlendis og verða þau varðveitt í lífsýnabanka LSH. Gögnin verða eingöngu notuð af rannsakendum og geymd á Rannsóknarstofu í Næringarfræði. Blóðsýnum og gögnum verður ekki eytt en með því að varðveita blóðsýnin gefur það rannsakendum tækifæri á að gera nýjar blóðmælingar í framtíðinni og hugsanlega að bera saman útkomu rannsóknarinnar við niðurstöður annarra rannsókna sem verða gerðar á komandi árum. Ef til þess kemur verður beðið um leyfi vísindasiðanefndar og einnig tilgreint nákvæmlega hver tilgangur með þeirri rannsókn er.

Hætt við þátttöku

Það er þitt val hvort þú tekur þátt í rannsókninni eða ekki. Þér er frjálst að hafna þátttöku eða hætta í rannsókninni á hvaða stigi sem er, án útskýringa.

Kær kveðja, með von um góðar undirtektir,

Jóna Björk Viðarsdóttir Einar S. Björnsson, Sigríður Erla Jóhannsdóttir , Alfons Ramel og Inga Þórsdóttir.

Rannsóknin er unnin með samþykki Vísindasiðanefndar og tilkynning hefur verið send til Persónuverndar**.** *Ef þú hefur spurningar um rétt þinn sem þátttakandi í vísindarannsókn eða vilt hætta þátttöku í rannsókninni getur þú snúið þér til Vísindasiðanefndar, Hafnarhúsinu við Tryggvagötu 17, 150 Reykjavík. Sími: 551-7100,*

1.11 APPENDIX XI - Informed written consent

UPPLÝST SAMÞYKKI FYRIR ÞÁTTTÖKU Í VÍSINDARANNSÓKN "Matarvenjur og næringarástand sjúklinga með bólgusjúkdóm í meltingarvegi- tengsl við sjúkdómsvirkni"

-Ég undirrituð/-aður samþykki að taka þátt í vísindarannsókninni " Matarvenjur og næringarástand sjúklinga með bólgusjúkdóm í meltingarvegi- tengsl við sjúkdómsvirkni".
-Þátttaka í rannsókninni felst í því að mæta einu sinni á umsömdum tíma á meltingardeild Landspítalann í blóðsýnatöku og jafnframt mæld líkamssamsetning þáttakenda.
-Ég samþykki einnig að svara almennum spurningalista og fylla út matardagbók fyrir þrjá daga.
-Niðurstöður rannsóknarinnar munu verða sendar til birtingar í virtum erlendum vísindatímaritum og verða kynntar fagfólki.
-Þátttakandi hefur lesið kynningarbréf fyrir " Matarvenjur og næringarástand sjúklinga með bólgusjúkdóm í meltingarvegi- tengsl við sjúkdómsvirkni".
-Blóðsýnum og gögnum verður ekki eytt en með því að varðveita blóðsýnin gefur það rannsakendum tækifæri á að gera nýjar blóðmælingar í framtíðinni og hugsanlega að bera saman útkomu rannsóknarinnar við niðurstöður annarra rannsókna sem verða gerðar á komandi árum. Ef til þess kemur verður beðið um leyfi vísindasiðanefndar og einnig tilgreint nákvæmlega hver tilgangur með þeirri rannsókn er.

Undirskrift þátttakanda:

Ég _____

lýsi því hér með yfir að ég gef samþykki mitt af fúsum og frjálsum vilja fyrir því að taka þátt sem sjálfboðaliði í þessari rannsókn. Ég hef fengið nauðsynlegar upplýsingar og lesið þær yfir.

Mér hefur verið kynnt eðli og umfang þessarar vísindarannsóknar og ég er samþykk(ur) þátttöku og skrifa því undir þessi tvö eintök:

_____
Dagsetning og staður:

_____
Undirskrift þátttakanda

_____
Undirritun þess sem aflar samþykkis

Ef þú hefur spurningar um rétt þinn sem þátttakandi í vísindarannsókn eða vilt hætta þátttöku í rannsókninni getur þú snúið þér til Vísindasiðanefndar, Hafnarhúsinu við Tryggvagötu 17, 150 Reykjavík. Sími: 551-7100, fax: 551-1444.

UPPLÝST SAMÞYKKI ÞETTA ER Í TVÍRITI, ÞÁTTTAKANDI HELDUR EFTIR EINU EINTAKI,
SÁ SEM AFLAR SAMÞYKKIS HELDUR EFTIR ÖÐRU EINTAKI

1.12 APPENDIX XII - General questionnaire

Spurningalisti fyrir þátttakendur

Nafn: _____ Dagsetning:_____

Kt: _____ Tölvupóstur f. matardagbók:_____

Þátttakendanúmer: _____

Hæð:_____ Þyngd:_____ BMI:_____ Mittisummál:_____ Fituprósenta:_____

Spurningar um sjúkdóm og lyfjanotkun

1) Sjúdómur:

❑ Crohn's:

- ❑ Í Ristli
- ❑ Í Smáþörmum
- ❑ Í Ristli og smáþörmum
- ❑ Veit ekki

❑ Sáraristilsbólga:

- ❑ Í vinstri hluta ristils
- ❑ Í öllum ristli
- ❑ Veit ekki

Ár frá greiningu: ___

2) Lyf:

❑ Remicade@

❑ Humira®

❑ Asacol® skammtur _____ mg/dag

❑ Imurel® skammtur _____ mg/dag

❑ Pentasa® skammtur _____ mg/dag

❑ Ekki á lyfjum:

❑ Annað: _____

3) Einkenni um bólgur í meltingavegi? (núna)

❑ Nei
❑ Já

4) Ef já hvaða:

Blóð í hægðum: ❑ Já ❑ Nei
Niðurgangur: ❑ Já ❑ Nei
Kviðverkir: ❑ Já ❑ Nei

Annað : _____

5) Hvenær finnst þér áhrifin af Remicade vera mest?

❑ Finn ekki mun

❑ Í 1. viku eftir lyfjagjöf

❑ í 2. viku eftir lyfjagjöf

❑ í 3-4 viku e lyfjagjöf

❑ í 5-7 viku e lyfjagjöf

6) Hvenær finnst þér sjúkdómseinkenni versna eftir lyfjagjöf (Remicade)?

❑ Fæ engin einkenni

❑ í 2. viku eftir lyfjagjöf

❑ í 3-4 viku eftir lyfjagjöf

❑ í 5-6 viku eftir lyfjagjöf

❑ í 7-8 viku eftir lyfjagjöf

7) Hefur þú aukaverkanir vegna lyfja? (Höfuðverkur, kláði, ógleði ofl)

❑ Aldrei
❑ Sjaldnar en vikulega
❑ Vikulega
❑ Nokkrum sinnum í viku
❑ ca 1x á dag
❑ Oft á dag

8) Tekur þú einhver önnur lyf?

❑ Nei
❑ Já, hvaða: _____

_____

9) Tekur þú einhver náttúrulyf?

❑ Nei
❑ Já, hvaða: _____

_____

10) Hefur þú notað kanabis til að minnka sjúkdómseinkenni?

❑ Nei
❑ Já

11) Tekur þú inn fæðubótarefni?

❑ Nei

❑ D-vítamín, Tegund_____ Magn_____

❑ B6-vítamín, Tegund_____ Magn_____

❑ B12-vítamín, Tegund_____ Magn_____

❑ Fólsýra, Tegund_____ Magn_____

❑ Járn, Tegund_____ Magn_____

❑ Fjölvítamín, Tegund_____ Magn_____

❑ Kalk, Tegund_____ Magn_____

❑ Acidophilus, Tegund_____ Magn_____

❑ Næringardrykki, Tegund_____ Magn_____

❑ Próteindrykki, Tegund_____ Magn_____

❑ Herbalife, Tegund_____ Magn_____

❑ LGG Magn_____

❑ Annað _____Tegund_____ Magn_____

12) Hefur þú notað/notar þú herbalife sem fæðubót (sjeik með eða án mat)?

❑ Nei
❑ Já

13) Ef já hvernig leið/líður þér af herbalife?

❑ Finn engan mun
❑ Vel
❑ Líður betur en af mat
❑ Fer illa í mig
❑ Fer mjög illa í mig

14) Tengir þú sjúkdómseinkenni við streitu?

❑ Nei
❑ Já
❑ Veit ekki

15) Tengir þú svefnleysi við aukin sjúkdómseinkenni?

❑ Nei
❑ Já
❑ Veit ekki

16) Hefur þú fæðuofnæmi og/eða fæðuóþol fyrir einhverju svo þú vitir?

❑ Nei
❑ Já (fæðuóþol _____ fæðuofnæmi ____)

17) Ef já, fyrir hverju hefur þú ofnæmi/óþol (merktu við allt sem á við)?

❑ Fiskofnæmi ❑ Staðfest af lækni
❑ Skelfiskofnæmi ❑ Staðfest af lækni
❑ Eggjaofnæmi ❑ Staðfest af lækni
❑ Mjólkurofnæmi ❑ Staðfest af lækni
❑ Mjólkursykursóþol (laktósaóþol) ❑ Staðfest af lækni
❑ Hnetuofnæmi ❑ Staðfest af lækni
❑ Glútenóþol ❑ Staðfest af lækni
❑ Sojaofnæmi ❑ Staðfest af lækni
❑ Annað ofnæmi – hvaða: _____

18) Hefur þú fengið nýrnasteina?

❑ Nei
❑ Já Hve oft? ____

19) Hefur þú greinst með næringarskort?

❑ Nei
❑ Já

20) Ef já, hvaða næringarskort? (t.d. járnskort, D-vít.skort, B-12 vít.skort etc.)

_____

21) Hvar sækir þú helst upplýsingar um næringu og fæðuval? Hægt að svara fleiru en 1

❑ Hjá lækni
❑ Næringarráðgjafa
❑ Næringarþerapista
❑ Hjúkrunarfræðingi
❑ Einkaþjálfara
❑ Starfsfólki í heilsubúðum/jurtaapóteki
❑ Vinum/fjölskyldu
❑ Internetinu
❑ Samtök CCU
❑ Annað - hvar: _____

22) Hefur þú hitt næringarráðgjafa eftir sjúkdómsgreiningu?

❑ Nei
❑ Já

23) Hefur þú fengið næringarráðgjöf hjá hjúkrunarfræðingi eða lækni eftir greiningu?

❑ Nei
❑ Já

Breytingar eftir sjúkdómsgreiningu

24) Léttist þú áður en þú greindist?

❑ Nei
❑ Já, léttist um ___kg

25) Hefur þú þyngst eftir að þú byrjaðir á lyfjum?

❑ Nei
❑ Já, þyngst um ___ kg

26) Breyttir þú um mataræði <u>eftir greiningu</u>?

❑ Nei
❑ Já

27) Ef já hverju breyttir þú eftir greiningu? (Borðar þú meira af einhverju eða minna? Sleppir þú einhverju alveg?)

	Meira af:	**Minna af:**	**Sleppt:**
❑ Mjólkurvörur (dæmi)	_____	_____	_____
	_____	_____	_____
❑ Ávextir (dæmi)	_____	_____	_____
	_____	_____	_____
❑ Grænmeti (dæmi)	_____	_____	_____
	_____	_____	_____
❑ Trefjaríkt (dæmi)	_____	_____	_____
	_____	_____	_____
❑Kjöt (dæmi)	_____	_____	_____

	_____	_____	_____
❑Unnar kjötvörur (dæmi)	_____	_____	_____
	_____	_____	_____
❑Fiskur (dæmi)	_____	_____	_____
	_____	_____	_____
❑Skyndibiti (dæmi)	_____	_____	_____
	_____	_____	_____
	Meira af:	**Minna af:**	**Sleppt:**
❑Gos (dæmi)	_____	_____	_____
	_____	_____	_____
❑Te/ kaffi (dæmi)	_____	_____	_____
	_____	_____	_____
❑Áfengi (dæmi)	_____	_____	_____
	_____	_____	_____
❑Krydd/ kryddaður matur (dæmi)	_____	_____	_____
	_____	_____	_____
❑ E-efni (dæmi)	_____	_____	_____

_____ _____ _____

❑ Annað
(dæmi) _____ _____ _____

_____ _____ _____

Spurningar um mataræði og sjúkdómseinkenni

28) Telur þú að mataræði hafi áhrif á sjúkdómseinkenni?

❑ Nei
❑ Já

29) Ef já, hvaða matvæli hafa mest áhrif?

Jákvæð áhrif: Neikvæð áhrif:

_____ _____

_____ _____

_____ _____

30) Borðar þú öðruvísi fæði þegar sjúkdómur er í versnun (t.d. síðustu vikuna fyrir lyfjagjöf með Remicade)?

❑ Nei
❑ Já

Ef já hvernig?

_____

_____

31) Borðar þú öðruvísi fæði þegar sjúkdómur er í bata ?

❑ Nei
❑ Já

Ef já, hvernig?

_____

Spurningar um núverandi fæðuneyslu

32) Hversu oft borðar þú:

Morgunmat: ❑ aldrei ❑ 1-2x í viku ❑ 3-4x í viku ❑ 5-7x í viku

Millibita: ❑ aldrei ❑ 1-2x í viku ❑ 3-4x í viku ❑ 5-7x í viku

Hádegismat: ❑ aldrei ❑ 1-2x í viku ❑ 3-4x í viku ❑ 5-7x í viku

Kaffitíma: ❑ aldrei ❑ 1-2x í viku ❑ 3-4x í viku ❑ 5-7x í viku

Kvöldmat: ❑ aldrei ❑ 1-2x í viku ❑ 3-4x í viku ❑ 5-7x í viku

Kvöldkaffi**:** ❑ aldrei ❑ 1-2x í viku ❑ 3-4x í viku ❑ 5-7x í viku

33) Hvaða af eftirfarandi kornvörum borðar þú í morgunmat? (hægt að svara fleiri en 1)

❑ Borða ekki kornvörur í morgunmat
❑ Hafra- eða bygggrautur
❑ Múslí
❑ Morgunkorn: Cheerios, Kornflex, All Bran, Wheetabix o.fl.
❑ Sykrað morgunkorn: t.d. Coco Puffs, Lucky Charms, Hunangs Cheerios o.fl.

34) Hversu oft í viku borðar þú eftirfarandi brauðtegundir?

	Aldrei	**Sjaldnar en vikulega**	**1-2x í viku**	**3-4x í viku**	**5-7x í viku**	**7x eða oftar**
Fín brauð (t.d. bónusbrauð,heimilisbrauð, pylsubrauð o.fl.)						
Gróf brauð (t.d. orkubrauð, fittybrauð, lífskornabrauð o.fl.)						
Mjög gróf brauð (t.d. danskt rúgbrauð, seytt rúgbrauð, sólkjarna rúgbrauð o.fl.)						

35) Hversu oft í viku borðar þú grænmeti og baunir?

	Aldrei	Sjaldnar en vikulega	1-2x í viku	3-4x í viku	5-7x í viku	7x eða oftar
Rótargrænmeti: t.d. gulrætur, rófur, kartöflur, sætar kartöflur, sellerírót..						
Laukar: t.d. laukur, hvítlaukur, blaðlaukur...						
Kál: t.d. blómkál, hvítkál, brokkolí..						
Salat: t.d. spínat, tómatar, gúrkur, paprika, kúrbítur, avokadó..						
Jurtir og krydd: t.d. engifer, ferskt chilli, basil, pipar..						
Baunir: t.d. nýrna-, linsu-, kjúklinga-, pinto-, smjör-, grænar baunir...						
	0	1	2	3	4	5

36) Eru einhverjar tegundir af grænmeti sem þú þolir illa?

Ferskt:	**Steikt/Soðið:**	**Niðursoðið:**
_____	_____	_____
_____	_____	_____
_____	_____	_____

37) Hversu oft í viku borðar þú ávexti og ber?

	Aldrei	Sjaldnar en vikulega	1-2x í viku	3-4x í viku	5-7x í viku	7x eða oftar
Sítrusávextir: t.d. appelsínur, sítrónur, greip...						
Ber: t.d. jarðaber, bláber, hindber..						

Aðrar ávextir: t.d. epli, perur, melónur, kíwí, vínber, bananar..						
Þurrkaðir ávextir: t.d. sveskjur, rúsínur, apríkósur..						
Hreinir ávaxtasafar						
	0	1	2	3	4	5

38) Eru einhverjar tegundir af ávöxtum sem þú þolir illa?

❑ Nei
❑ Já, hvaða?

_____

_____

39) Ert þú á einhverju sérfæði?

❑ Gerlausu fæði
❑ Glútenlausu fæði
❑ Hveitilausu fæði
❑ Sykurlausu fæði
❑ Mjólkurlausu fæði
❑ Eggjalausu fæði
❑ Lífrænt fæði
❑ Hráfæði
❑ Fitusnautt
❑ Lágkolvetnamataræði (LKL)
❑ Annað sérfæði: hvaða? _____

40) Hvaða tegund af mjólk drekkur þú aðallega? (hægt að svara fleiri en 1)

❑ Drekk ekki mjólk
❑ Nýmjólk
❑ Léttmjólk
❑ Undanrenna/ fjörmjólk
❑ Soyamjólk
❑ Rísmjólk
❑ Haframjólk
❑ Möndlumjólk

41) Hvað notarðu aðallega sem sykurgjafa? (hægt að svara fleiri en 1)

❑ Sykur
❑ Hrásykur
❑ Púðursykur
❑ Stevia

❑ Agave
❑ Sætuefni
❑ Hunang
❑ Síróp
❑ Hlynsíróp

42) Tekur þú inn lýsi?

❑ Nei
❑ Já

43) Ef já hversu oft í viku tekur þú lýsi?

❑ Einu sinni eða minna
❑ 2-3x í viku
❑ 4-5x í viku
❑ 5-7x í viku

44) Hvað borðarðu fisk oft í viku?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

45) Hversu oft í viku drekkur þú <u>sykrað</u> gos?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

46) Hversu oft í viku drekkur þú gos með sætuefni? (diet drykkir)

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

47) Hversu oft í viku drekkur þú kaffi?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

48) Hversu oft í viku drekkur þú svart te?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

49) Hversu oft í viku borðar þú reyktan mat?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

50) Hversu oft í viku borðar þú steiktan mat?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

51) Hversu oft í viku borðar þú djúpsteiktan mat?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

52) Hversu oft í viku borðar þú grillaðan mat?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

53) Hversu oft í viku borðar þú saltaðan mat (t.d., saltkjöt eða saltfisk)?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

54) Hversu oft í viku borðar þú súrsaðan mat?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

55) Hversu oft í viku borðar þú skyndibitafæði?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

56) Hversu oft í viku borðar þú súkkulaði, kex eða nammi?

❑ Aldrei
❑ Nokkrum sinnum á ári
❑ Sjaldnar en vikulega
❑ 1-2x í viku
❑ 3-4x í viku
❑ 5x eða oftar

57) Forðast þú mat sem inniheldur rotvarnarefni eða lík efni (E-númer)?

❑ Nei
❑ Já

58) Tekur þú inn MCT fitu?

❑ Nei
❑ Já

Spurningar um lífsstíl og menntun

59) Drekkur þú áfengi? Ef þú drekkur áfengi hve marga drykki af áfengi drekkur þú <u>að meðaltali</u> á viku? (einn drykkur er 1 lítill bjór, 1 léttvínsglas, 1 einfaldur sterkur drykkur)

❑ Nei
❑ 1 drykk eða minna á viku
❑ 2-5 drykki á viku
❑ 6-10 drykki á viku
❑ >10 drykki á viku

60) Reykir þú?

❑ Nei
❑ Já

61) Reyktir þú fyrir greiningu?

❑ Nei
❑ Já

62) Hreyfir þú þig reglulega? Ef þú hreyfir þig hversu oft í viku stundar þú líkamrækt?

❑ Nei
❑ Einu sinni eða minna
❑ 2-3x í viku
❑ 4-5x í viku
❑ 5-7x í viku

63) Ef þú hreyfir þig hversu mikið hreyfir þú þig á dag?

❑ Minna en 30 mínútur á dag
❑ Meira eða jafnt og 30 mínútur á dag

❑ Meira en 1 klst á dag

64) Hver er hjúskaparstaða þín?

Ég…

- ❑ er gift/-ur
- ❑ er í sambúð
- ❑ er fráskilin/-n
- ❑ er einhleyp/-ur
- ❑ ekkja/ekkill
- ❑ bý hjá foreldrum

65) Hver er menntun þín?

- ❑ Grunnskólamenntun
- ❑ Framhaldsskólamenntun
- ❑ Háskólamenntun
- ❑ B.Sc/B.A/B.Ed
- ❑ M.Sc/M.A/M.Ed/Cand. psyc
- ❑ Verknám
- ❑ Annað nám:_____