

**The effect of a low FODMAP diet in addition to a
gluten free diet on symptoms and quality of life in
patients with coeliac disease and IBS-like symptoms:
A randomized, controlled clinical study**

NUCLI395 – Master’s Thesis in Clinical Nutrition



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FOREWORD

The last five years as a student at the University of Bergen has been instructive and rich in memories. The last one and a half year has been especially exciting and challenging. I have learned a lot about performing a clinical study and I have also learned more about myself. It has been a great experience working with this study, and I am very glad that I chose this project about coeliac disease and irritable bowel syndrome. I want to thank the well-informed project director and teaching supervisor Jan Gunnar Hatlebakk for the establishment of this project. I also want to thank him for inspiration and good support, in spite of having a busy work day! Gudrun Kahrs was my other teaching supervisor, and she has contributed with relevant dietetics. I want to thank her for her engagement in this project!

It has been great to carry out the project together with my fellow student, Ida Strindmo. I want to thank her for the co-operation and many enthusiastic discussions! Thanks to Kostdata for co-operation on establishing the FODMAP (fermentable oligo-, di- and monosaccharides and polyols) database. I also want to thank all the participants for being a part of our project. And thanks to employees at the Medical Department for helping us with consultation rooms.

Further, I want to thank LMS (Learning and Mastery Centre in Bergen) and NCF (Norwegian Coeliac Society) and especially Kari Husebø in NCF Hordaland for publishing information about our project on their web page.

In the end, thanks to my family and friends for good support and encouraging words!

Several studies have found an effect of reducing the intake of food rich in FODMAPs when having an irritable bowel. As far as we know, there are no published papers on low FODMAP diet to patients with coeliac disease. We therefore wanted to investigate whether the diet could have an effect on symptoms, quality of life, gas production and microbiota in addition to a gluten free diet.

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ABSTRACT

Background: Around 20-30% of coeliac disease patients have IBS-like symptoms. The low FODMAP diet (low in fermentable oligo-, di-, monosaccharides and polyols) is used as treatment for irritable bowel syndrome (IBS) to reduce gastrointestinal symptoms. As far as we know, there are no published papers on low FODMAP diet to patients with coeliac disease.

Purpose: We wanted to investigate whether patients with coeliac disease and IBS-like symptoms could have a benefit from using this diet in addition to their gluten free diet, especially regarding abdominal symptoms and quality of life. Traditionally, these have been given advice to further eliminate traces of gluten in their diet. We compared this strategy to a reduction in FODMAPs as instructed by a clinical dietitian.

We also wanted to investigate whether a low FODMAP diet would have any effect on the gut microbiota and the degree of fermentation by gut bacteria, measured with breath tests and stool samples (another Master's Thesis). The objective was to investigate whether this is a treatment which can be recommended for coeliac patients with IBS-like symptoms or not.

Method: Forty patients with coeliac disease-, and IBS-like symptoms confirmed by the Rome III criteria and score > 75 on IBS-SSS (Symptom Severity Scale) were included in the study. They were randomized into two groups. Group A followed a more strict gluten free diet for six weeks and were supposed to exclude all wheat starch and food labelled "traces of gluten" from their diet. Patients in group B continued to follow a traditional gluten free diet in addition to following a low FODMAP diet for six weeks. Symptoms (Irritable bowel syndrome- Symptom Severity Scale) were recorded at baseline, three and six weeks. Quality of life (SF-36), 4 days prospective dietary intake records, blood tests, breath tests and stool samples were carried out at baseline and after six weeks on their diets. Compliance and satisfaction with the two diets were evaluated by VAS-scales after 6 weeks, and 1 month after the intervention ended in group B. All the patients were given dietary counselling by master students in clinical nutrition. Dietist Net Free was used to calculate the amount of FODMAPs in the diets at baseline and at six weeks. Statistics: T-tests, non-parametric tests, categorical tests, ANOVA, Friedman and correlation tests.

Results: Twenty patients were included in each group; group A (18F/2M, age 39±15) and group B (15F/5M, age 43±12). At baseline, 42.5% had constipation problems (IBS-C), 27.5% diarrhoea problems (IBS-D) and 30% both (IBS-M). At baseline, 20% in group A vs. 10% in group B had mild IBS, 45% vs. 65% moderate and 35% vs. 25% severe IBS symptoms. After six weeks there were statistically significant differences between the groups ($p=0.0425$); 10% vs. 25% were in remission, 15% vs. 45% had mild IBS, 65% vs. 25% moderate and 10% vs. 5% severe.

There were 5 patients in group A and 1 in group B that had raised anti-transglutaminase 2 IgA-levels, vs. 2 and 3 with raised anti-deamidated gliadin IgG-levels. The FODMAP intake decreased statistically significant from 7.7 (2.7-19.2) g/day at baseline to 1.3 (0.9-2.1) g/day at six weeks in group B ($p=0.0001$), vs. a non-significant decrease from 14.5 (10.9-21.6) to 12.1 (6.4-19.5) g/day in group A.

There was a statistically significant reduction in total IBS-SSS for both groups from baseline to six weeks. The mean score in group A at baseline was 260 ± 90 , while it was 204 ± 75 at six weeks ($p=0.0022$), vs. 263 ± 70 at baseline, and 145 ± 84 at six weeks in group B ($p<0.0001$).

There was a statistically significant difference between the two groups at 6 weeks ($p=0.025$). The five main IBS-SSS-questions were all statistically significant reduced in group B at six weeks; abdominal pain severity (41.0 (28.8-52.5) vs. 14.5 (0.0-23.5), $p<0.0001$), abdominal pain frequency (4.0 (2.3-7.0) vs. 2.0 (0.0-4.0), $p=0.0016$), abdominal bloating severity (60.0 (44.0-72.8) vs. 19.5 (2.0-34.5), $p<0.0001$), dissatisfaction with bowel habits (61.5 (41.5-88.5) vs. 43.5 (27.0-56.5), $p=0.0196$) and interference with daily activities (57.5 (40.5-84.5) vs. 24.0 (15.8-45.4), $p<0.0001$). The question about abdominal pain severity was also statistically significant reduced in group A, but the four other main questions were not.

Regarding quality of life, there was an improvement in physical component summary in group B (45 ± 8 vs. 48 ± 8 , $p=0.0061$) but not in group A or when looking at mental component summary. Patients in group B were statistically significant more satisfied with pain relief ($p=0.0132$) and though it was more challenging to follow their diet ($p=0.0008$), than group A.

Conclusion: This study showed a statistically significant improvement in abdominal symptoms and subjective report of physical health in a group of patients with coeliac disease and irritable bowel syndrome-like symptoms after following a low FODMAP gluten free diet for six weeks. The low FODMAP diet was more effective than a more strict gluten free diet, and should be offered to coeliac patients with IBS- like symptoms.

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ABBREVIATIONS

ALAT= Alanine aminotransferase

ALT= Alanine transaminase

BMR = Basal metabolic rate

CCK= Cholecystokinin

CRP= C-reactive protein

FGID= Functional gastrointestinal disorder

FODMAP= Fermentable oligo-, di- and monosaccharides and polyols

FOS = Fructooligosaccharides

GERD= Gastroesophageal reflux disease

GFR= Glomerular Filtration Rate

GLUT-2= Glucose transporter 2

GLUT-5= Fructose transporter 5

GOS= Galacto-oligosaccharides

GT= Gamma-glutamyl transpeptidase

HLA= Human leukocyte antigen

HRQOL= Health related quality of life

HUS= Haukeland University Hospital

IBD= Inflammatory Bowel Disease

IBS= Irritable bowel syndrome

IBS-C= Irritable bowel syndrome dominated by constipation

IBS-D= Irritable bowel syndrome dominated by diarrhoea

IBS-M= Irritable bowel syndrome with both diarrhoea and constipation (mixed)

IBS-SSS= IBS Severity Scoring System

IgA= Immunoglobulin A

IgG= Immunoglobulin G

IQR = Inter quartile range

LKB= Laboratory for Clinical Biochemistry

LMS= Learning and Mastery Centre in Bergen

MCS= Mental component summary (part of SF-36)

MCV= Mean cell volume

MOS=Medical Outcomes Study

NCF= Norwegian Coeliac Society

NCFU= Norwegian Youth Coeliac Society

NICE= National Institute for Health and Clinical Excellence

PCS= Physical component summary (part of SF-36)

PTH= Parathyroid hormone

QoL= Quality of life

REK- Vest= Regional committee for medical research ethics in Western Norway

SD= Standard deviation

SF-36= 36-item Short-Form Health Survey (Physical and mental health)

SIBO= Small intestinal bacterial overgrowth

TSH= Thyroid-stimulating hormone

UEGW= United European Gastroenterology Week

UiB= University of Bergen

VAS= Visual Analog Scale

1. INTRODUCTION

1.1 COELIAC DISEASE

1.1.1 What is coeliac disease?

Coeliac disease is a chronic inflammatory, autoimmune disease and it is multisystemic which means that the whole body is affected, not just the bowel. The small bowel is sensitive to gluten (1) which is a composite of the proteins gliadin and glutenin (see figure 1). These proteins are primarily found in wheat, but immunogenically similar proteins are found in barley and rye. It is especially the gliadin which is responsible for the damage and it can induce oxidative stress. Gliadin can stimulate both the innate and the adaptive immune system.

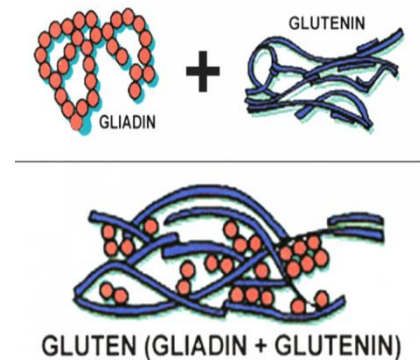


Figure 1: Gluten is composed of gliadin and glutenin (2).

When a person with coeliac disease eats gluten, the gluten peptides will react with tissue transglutaminase 2 and be deamidated. Gluten peptides will thereafter stimulate T-cells and this leads to a binding to the molecules HLA-DQ2/8 which are expressed on antigen-presenting cells. Through B-cells antibodies will develop and can be released into the blood stream. The mucosal layer and the villi in the small bowel will be damaged. There is not enough knowledge about why and how gluten harms the gut (1).

1.1.2 Pathophysiology and causes

The duodenum wall has four layers. The innermost layer is the mucosa, the next submucosa, then muscularis externa and outermost serosa (see figure 2).

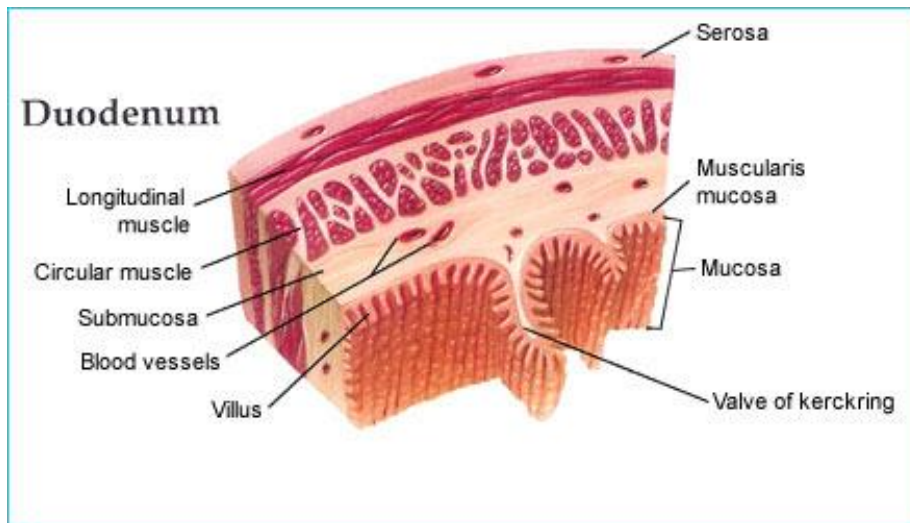


Figure 2: The four wall layers of the duodenum (3) .

Villous atrophy in the mucosal layer of the duodenum, crypt hyperplasia and intraepithelial lymphocytes are typical findings in a damaged small bowel in coeliac disease (1) (see figure 3). The cause of villous atrophy can be increased apoptosis of enterocytes. A leaky gut will allow antigens to pass, one will react with autoimmunity and an influx of white blood cells is the first thing that happens (inflammation) (4). Tight junctions play an important role in the pathomechanism of coeliac disease. A deterioration of these can cause an increased permeability of the epithelial barrier function, and abnormal passage of antigens through the epithelial layer can continue (5, 6).

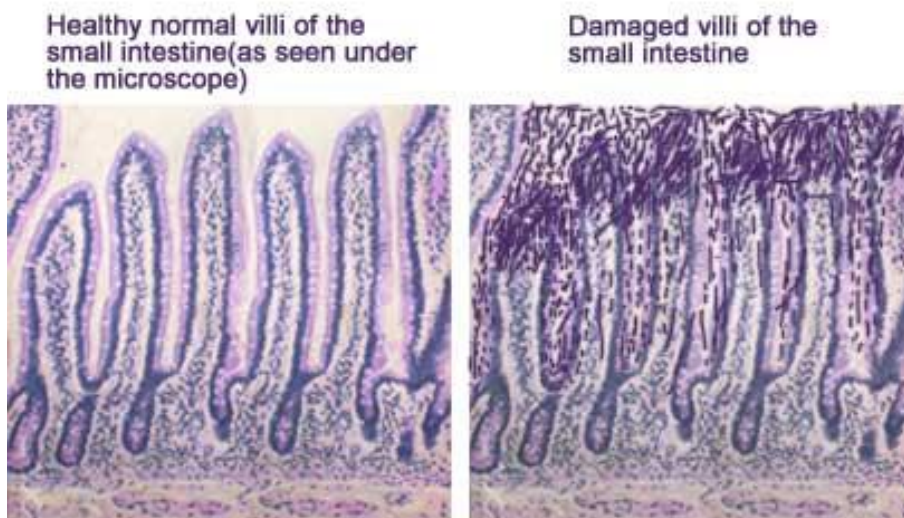


Figure 3: A healthy gut (to the left) and a damaged gut (to the right) (7).

The Marsh classification of the microscopic findings in duodenal biopsy is used to describe how serious the damage in the bowel is (8). Classified with type 0 means that the gut looks normal

and coeliac disease is not present or is in remission. Increasing numbers means more damage. Type 1 is nonspecific and often common in patients eating a gluten free diet with small amounts of gluten. The number of lymphocytes is increased, but the crypts and the villi will be normal. This type can also be seen when having infections. Latent coeliac disease is when the biopsies from the duodenum are normal, but the serology is changed (9). Type 3c is the most severe and dramatic type, and the patient is having complete villous atrophy.

Breastfeeding and a small amount of gluten-protein in the breast milk is a protective factor in developing the disease (10-12), and the child should not be exposed to gluten for the first six months of life (13). Coeliac disease has a strong genetic component. More than 95% of all the patients have the HLA (human leukocyte antigen)-genotypes DQ 2 or 8 (9, 14).

1.1.3 Epidemiology

The prevalence is about 1 in 100 in Europe and the disease can be diagnosed at any age (1, 9, 15, 16). Earlier, researchers believed that the disease was a children's disease, and that it disappeared when the children grew up. The prevalence has increased the last 50 years (17), and there is data suggesting that a lot of people have the disease without knowing it (18). One is born with a hereditary tendency to develop coeliac disease. The HLA DQ2 or DQ 8-genes are almost always present (19). The prevalence in first-degree relatives is about 10%, and in second-degree about 2% (20). One has to ingest gluten to develop the disease.

1.1.4 Signs and symptoms

When the small bowel gets damaged, the area where nutrients are absorbed will be reduced, and this can cause malabsorption. Malabsorption can lead to deficiencies in macro- and micronutrients, which again can cause weight loss and children may fail to thrive (1). Other frequent symptoms are tiredness, irritability, diarrhoea, abdominal pain, depression, anaemia, bone disorders, infertility and neurological symptoms (1). Approximately 50% do not have symptoms at all (silent coeliac disease) and therefore live with the disease undiagnosed for many years (21, 22).

When the patients attain a strict gluten free diet, they usually do not feel symptoms (anymore). Unfortunately, some do. Irritable bowel syndrome, microscopic colitis, pancreatic insufficiency or lactose intolerance can be possible explanations.

1.1.5 Diagnosis

The patient has to eat a normal diet with gluten for > 4 weeks before the blood tests and biopsies are taken. This is extremely important to avoid false negatives (1). Blood antibodies are measured in serological tests. IgA (immunoglobulin A)-antibodies against the tissue transglutaminase 2-enzyme (tTG) is the most important blood test. This will normally be raised in coeliac patients. Anti-deamidated gliadin IgG (immunoglobulin G) is also measured (1, 4). If both these blood tests are raised, the patient most likely has coeliac disease. If only the anti-deamidated gliadin IgG is raised, total IgA is also measured to check for IgA-deficiency (23). If IgA-deficiency is found in addition to a raised anti-deamidated gliadin IgG, the diagnosis is likely (23).

To make a positive diagnosis in adults, a gastroscopy with a biopsy of the duodenum is also needed (24). The biopsy will identify if the bowel is damaged (1), and be used to Marsh-classify the severity of the disease.

As mentioned, the HLA-genotypes DQ2 or DQ8 are the most common in coeliac patients (9, 14, 19). About 33% of the Norwegian population has the DQ2-genotype (9). In the absence of one of these genotypes, the diagnosis is very unlikely. Genetic typing is on the other hand not enough to get diagnosed.

1.1.6 Treatment

The only treatment for coeliac disease today is a life-long exclusion of gluten from the diet, regardless of the severity of symptoms (1). When gluten is avoided, the bowel will start to heal, and after a year or more the bowel is usually completely restored (1, 25-29). A study found that around 40% of the patients still had some extent of villous atrophy after following a gluten-free diet for two years though (30), and 10% after five years (31). Antibodies will probably still be present for 6 months-1 year. Some nutritional deficiencies can persist (32, 33), but when the disease is controlled, nutrients will usually be absorbed normally again, symptoms will decrease and the risk of getting other diseases will reduce.

Coeliac disease is a multisystem disease, and patients should be monitored and followed-up for the rest of their lives, ideally yearly or more often if abnormalities and/or symptoms are present. This is unfortunately not always possible. The National Institutes of Health (NIH) in the U.S. suggests this treatment (34):

- *Consultation with a skilled dietician*
- *Education about the disease*
- *Lifelong adherence to a gluten-free diet*
- *Identification and treatment of nutrient deficiencies*
- *Access to an advocacy group*
- *Continuous long-term follow-up by a multidisciplinary team*

1.1.7 The gluten-free diet

When eating a gluten-free diet all dietary sources of wheat, barley, rye, triticale, kamut, manitoba and spelt, and all products made from these grains (bread, pasta, biscuits, cakes, bulgur, couscous etc.) have to be excluded. Gluten is also added to a lot of other products such as sauces, soups and semi-manufactured foods (1), so it is important to read the labels carefully. Gluten-free products are often marked with a symbol (see figure 4), and gluten-containing products should be allergen labelled.



Figure 4: The “gluten-free”-symbol (35).

There are two ways of labelling gluten-free products (36):

- “Very low gluten-content”: Up to 0.1 g gluten/kg. Gluten is removed from these products, but “traces of gluten” and wheat starch is OK.
- “Gluten-free”: Up to 0.02 g gluten/kg. The product is gluten-free.

It is important to replace the excluded foods with other gluten-free foods to maintain a nutrient-rich and balanced diet. Carbohydrates, fibre, proteins, iron, calcium, folate and thiamine are nutrients there can be deficient (37). The need for these should be met with other foods or supplements. One should use a multivitamin- and mineral supplement to correct for possible deficiencies the first four months and later if the diet is undiversified. In particular, the gluten free diet can easily get poor in dietary fibre. It is recommended to eat five fruits or vegetables a

day, and fleawort seeds, potato fibre or oat can be used as dietary fibre replacements.

Today, there are a lot of alternative products, and the assortment is expected to increase in the future. Semper ®, Schar ®, Finax ®, Holmen-Crisp ®, Toro ® and Fria ® are some manufacturers. Fresh meat, poultry, fish, cheese, eggs, fruit, vegetables, milk, milk products, legumes, potatoes, mushrooms, berries, nuts, seeds, oil and butter are naturally gluten-free and should therefore be included in a gluten-free diet.

Oat does not contain gluten, and is therefore advised to be a part of a gluten-free diet if it is not contaminated with gluten (1). Oat is a good source for soluble fibre, vitamins and minerals, and is prebiotic for the good bacteria in the intestine. It can give symptoms to a small number of patients with coeliac disease if it is contaminated with small amounts of gluten (38-40). Some will be temporary lactose intolerant before the duodenum has healed, and get symptoms when ingesting milk and milk products. Cultured milk is often better tolerated. The patients can usually start to ingest whole milk and milk products 6 weeks after starting on a gluten-free diet (41).

Wheat starch is usually tolerated since both the fat and the gluten protein is removed, and there are only carbohydrates left. Hydrolysed vegetable proteins, glutamate and additives are also gluten free.

People with coeliac disease should learn which foods that contain gluten and which are gluten-free, and the label should be read carefully every time. Hygiene in the kitchen is also extremely important. Patients should have a “gluten free- zone” to avoid any gluten-contamination during preparation of meals and storage of foods (1, 42). Separate and clean toasters, bread boxes and baskets, knives, chopping boards, utensils etc. should be used.

Some patients do not have symptoms at all, and may therefore be inclined to eat gluten since they can't feel any difference. It is still important that these people attain a gluten-free diet. Others may think it is embarrassing or nagging to say that they can't eat gluten, and therefore have poor compliance to the diet when eating with friends or in restaurants.

1.1.8 Associated conditions and possible long-term consequences

Patients with coeliac disease have a greater risk of getting other autoimmune diseases such as diabetes type 1, Sjogren's syndrome, multiple sclerosis and thyroid disease (43-45). Coeliac disease and diabetes type 1 has a similar genetic background. Around 5% of the patients with coeliac disease also have type 1 diabetes mellitus (43). Around 9.3% of patients with coeliac disease have small intestine bacterial overgrowth (SIBO) (46). Dermatitis herpetiformis, anaemia, abnormal liver function, Down's syndrome and osteoporosis are also more common in people with coeliac disease (1).

Bread and cereals are products rich in calcium. The intake of these products is often reduced on a gluten-free diet (47) and there can also be a malabsorption of calcium (48). This leads to a reduced bone mineral density and can develop to osteoporosis (47, 49).

The patient with coeliac disease has to adhere to a lifelong strict gluten-free diet. If not, the risk of developing other symptoms and diseases increases. The disease can also affect other organs than the bowel. Malignancy (50) and infertility are some possible long-term consequences. There is an increased risk of developing lymphoma if the patient do not adhere to a strict gluten free diet, compared to the general population (51).

Some few will develop refractory coeliac disease although eating a strict gluten free diet (52). They will still have villous atrophy and abdominal symptoms, and the disease often requires additional treatment. There is no evidence of other pathology. Weight loss and diarrhoea is common. There are two types of refractory coeliac disease; type 1 and type 2. Having type 2 can increase the risk of getting gut cancer and there is a greater mortality after two years (41%) compared to type 1 with 14% mortality after two years (53).

1.2 IRRITABLE BOWEL SYNDROME (IBS)

1.2.1 Functional gastrointestinal disorders

Functional gastrointestinal disorders (FGID) are diseases where the doctors can't find any organic, structural, metabolic or infectious damage when doing gastroscopy and taking biopsies of the small bowel (4). These disorders are exclusion diagnoses based on symptoms, and the different diseases often have common and overlapping symptoms. Irritable bowel syndrome (IBS), food intolerances, gastroesophageal reflux disease (GERD) and functional dyspepsia are some examples. It is normal to have more than one of these diseases (4).

1.2.2 Irritable bowel syndrome and symptoms

Typical symptoms when having an irritable bowel are problems with evacuation like diarrhoea and constipation, nausea, vomiting, abdominal pain, exhaustion and flatulence. The gut reflex is enhanced and many will feel pain relief when evacuating.

In addition, people with IBS often have a reduced quality of life (QoL) (54-58). IBS-patients do have an equal or worse QoL than patients with GERD, heart failure, kidney disease and diabetes (57-59). The physical symptoms and the mental discomfort both affect each other. It can be really demanding having an irritable bowel in social settings. Patients with IBS often have more anxiety, depression and tiredness than others (60). It is especially the restrictions in the diet, mood changes and limitations in the daily life that reduces IBS-patients QoL (61).

1.2.3 Pathophysiology and causes

IBS is a multifactorial disease (1). There are many different hypotheses about the development. The abdomen and the bowel are more sensitive to extern- (food, stress, psychosocial disturbance) and intern stimulus and this leads to altered motility and reflexes in the gut (62). Stress and anxiety can affect the stomach's motor function and therefore worsen the situation (63-65). Changes in the diet and/or the emotional life in a person with IBS can give abdominal symptoms more often than in people without IBS. This is called visceral hypersensitivity (66, 67), and the mobility in the abdomen and the gut is altered and causing a gastrointestinal dysfunction. When eating, the bowel will expand and this can cause tension and pain (68).

The syndrome is often called “the brain-gut axis syndrome”, since researchers believe that people with IBS are more sensitive and have alterations in brain-gut signals. Different nutrients activate different receptors and control evacuation. It is particularly CCK (cholecystokinin) and serotonin that are changed in people with IBS (68).

Other possible causes are genes, microbiota, low grade inflammation and food intolerances. The syndrome can also arise after an infection (post-infectious IBS), like for example the Giardia-breakout in Bergen in 2004 (69, 70). Infections and inflammations leads to approximately 10-20% of the IBS-onsets (1).

1.2.4 Epidemiology

The syndrome is more common in women than men (1). The prevalence is about 9-23% (71), but it is expected that it is actually higher. The disease is often symptomatic in stressful situations and transitional periods in life, especially in people younger than 45 years (72).

1.2.5 Diagnosis

IBS is a diagnosis of exclusion. Differential diagnoses like coeliac disease, food intolerances, colorectal cancer, bacterial overgrowth and inflammatory bowel diseases have to be excluded before diagnosing IBS (1).

The Rome III criteria are used to set the diagnosis. The diagnostic criteria are:

Recurrent abdominal pain or discomfort at least 3 days per month during the last 3 months, present for at least 6 months, associated with two or more of the following:

- 1. Improvement with defecation*
- 2. Onset associated with a change in frequency of stool*
- 3. Onset associated with a change in form (appearance) of stool (73)*

There are three different categories of the disease according to what form of stool that is predominant; diarrhoea (IBS-D), constipation (IBS-C) or a mix (IBS-M) (4, 73). IBS can be mild, moderate or severe. Around 40% have mild IBS, 35% moderate and 25% severe (74).

Breath tests are used to measure the amount of methane and hydrogen in exhaled air. Unabsorbed saccharides in the gut will lead to gas production by bacteria in the colon. Then, the gases will be absorbed into the blood and excreted in the breath. In this way, malabsorption of carbohydrates and then fermentation can be evaluated (1, 4, 75). Before this test, the patient can't eat or drink for at least 10 hours. Studies (76, 77) have found that 22-54% of patients with IBS have a positive hydrogen or lactulose breath test. Nevertheless, there is not always a correlation between symptoms and amount of gas produced in the gut (78, 79).

1.2.6 Treatment

There is no satisfactory medical treatment for IBS (80). It is important to tell the patients that the condition is without risk and not an organic damage. The syndrome can nevertheless be annoying and have a negative impact on the patient's social life (1). The recommended strategy is to combine dietary management with pharmacological- and lifestyle management. Probiotics and peppermint oil may have an effect. Kerutabs and Lactrase (lactase enzymes) are medications which can be used if a patient is bothered with diarrhoea after ingesting lactose. These medications are taken together with food rich in lactose, and can be used when eating at restaurants etc. (41). Faecal transplantation is another possible treatment, but there is a need for more research in this field.

Dietary management

Dietary management is amongst the best management for IBS. It is hard to give general dietary advice to people with IBS since the toleration for different types of food can be very different (81). Patients with IBS should be encouraged to eat a normal, varied and healthy diet (1) with small and frequent meals (5-7 a day) instead of few and big meals. The goal for the nutritional management is to secure an adequate intake of all the macro- and micronutrients and to reduce symptoms. It is important that there are as few restrictions as possible in the diet (41).

Fatty, roasted, spicy or smoked food, caffeine, alcohol, lactose, fructose and sorbitol can often cause problems when having an irritable bowel. It is also important to sleep enough, be physically active, drink enough water, and aim to have regular evacuations (1).

At Haukeland University Hospital (HUS), patients are offered two days on an IBS-school. Here they will get information from a doctor, a clinical dietitian, a psychologist, a physiotherapist and also a representative from the Norwegian Labour and Welfare Organisation.

1.3 The low FODMAP diet

1.3.1 Background and hypothesis

The low FODMAP diet was invented by Sue Shepherd and her Australian colleagues in 1999 at Monash University for people with IBS (82). The diet is well documented (67, 75, 83-90) and may give symptom relief instead of curing the disease (67). FODMAP is an acronym for fermentable oligosaccharides (fructans and galactans), disaccharides (lactose), monosaccharides (fructose) and polyols (sorbitol, mannitol, xylitol, maltitol etc.). These are short-chained carbohydrates and sugar alcohols which are not fully digested in the small bowel and will therefore be fermented by bacteria in the colon.

Malabsorption of FODMAPs happens to everyone to a certain degree (91), but patients with IBS will have abdominal pain or other symptoms as a consequence. The FODMAPs have a high osmotic effect, gas and short-chained fatty acids are produced (see figure 5) and this can cause pain, flatulence, an alteration in the motility and sensation of the gut and altered evacuation pattern (diarrhoea, constipation) (1, 4, 54, 92).

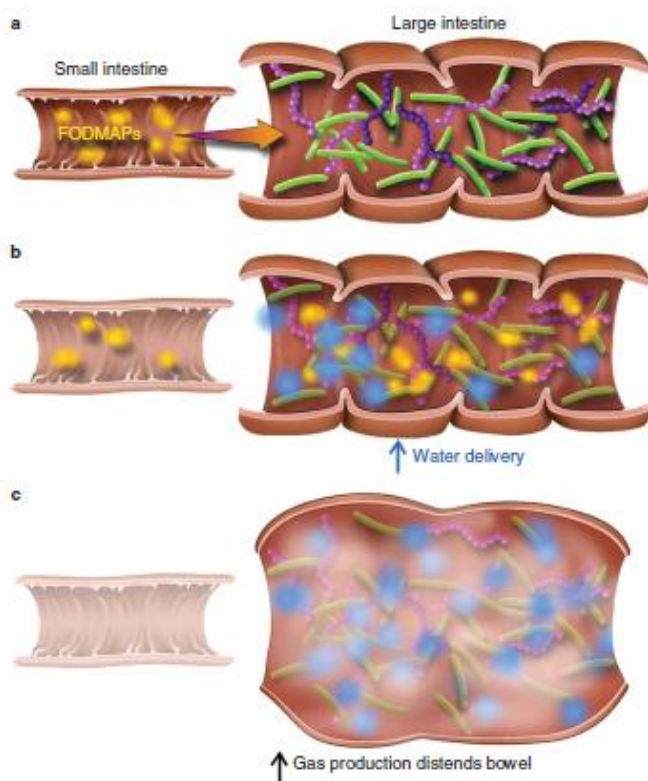


Figure 5: FODMAPs are poorly absorbed in the small intestine and can cause gas production and abdominal symptoms (75).

1.3.2 The different FODMAPs

Fructose is a monosaccharide and is transported across the intestinal epithelium to a low degree by GLUT-5 (fructose transporter 5). A very high intake of fructose will not be absorbed (with or without IBS). Around 50% of the world's population have problems absorbing 25 g of fructose (93). The absorption is more effective if a glucose-molecule is absorbed together by the GLUT-2 (glucose transporter 2). On a low FODMAP diet fructose should therefore not be eaten in excess of glucose. On the other hand, eating fructose together with sugar alcohols can worsen the absorption.

Lactose is a disaccharide consisting of galactose and glucose. The enzyme lactase hydrolyses lactose so it can be absorbed into the blood. People with IBS can have brush-border enzymes with a reduced activity, and this can lead to a lactose-malabsorption. Approximately 2-3% has lactose-intolerance in Norway, while as many as 70-90% has it worldwide (94). A double-blind clinical trial found that 17 out of 70 (24.3%) patients with IBS vs. 2 out of 35 (5.7%) of the controls had lactose intolerance (95). In comparison, a case-control study performed in Norway found the prevalence to be 4.1% in IBS-patients and 3.8% in the controls (96).

Oligosaccharides consist of between two and ten monosaccharides. Galacto-oligosaccharides (GOS) are fructose, galactose and glucose connected to each other. The two main types are raffinose and stachyose.

Another group of oligosaccharides are fructans which consist of fructose-molecules and a glucose-molecule. There are two main subgroups. Fructo-oligosaccharides (FOS) have less than 10 monosaccharides while inulin has more than 10. Inulin and FOS are often added to gluten free products to raise the content of dietary fibre. The mean intake of fructans in England is 4 g/day and 2,6 g/day in USA (97). Approximately 69% of the fructans being consumed in England is from wheat (97). Type of grain, growth conditions and preparation method affect the amount of fructans in grain. Everyone (including people without IBS) has a lack of hydrolase enzymes which breaks down the bindings in these saccharides, which leads to a malabsorption of galactans and fructans, and then symptoms for IBS-patients.

Polyols are sugar-alcohols that are too big to get transported passively through pores in the gut (98). They are absorbed slowly and incomplete. IBS-patients also have a lack of transport systems for polyols. This can all cause gastrointestinal symptoms (4).

1.3.3 The diet

The principle of the diet is to first have a very low intake of food rich in FODMAP for six weeks and thereafter start gradually to introduce one FODMAP group at a time, and find an individual limit of tolerance for FODMAPs (99). There is no threshold level or an absolute amount of FODMAP that is well tolerated. FODMAPs have an accumulating effect. Therefore, it will vary between patients which of the different FODMAP groups and what total amount that is tolerated. Patients should be guided by a dietitian and it is important to not exclude more food than necessary. The dietitian should emphasize that FODMAPs are carbohydrates, but it is anyhow not a low carb-diet. Food such as clean meat, poultry, fish, egg, fats and oils do not contain FODMAPs and can be eaten. Glucose, sucrose, dietary fibre and starch usually do not give symptoms, and can be a part of the diet.

Table 1 shows food rich in the different FODMAP groups. These foods should be avoided or reduced in the first phase of the diet.

Table 1: Food high in FODMAP (99).

FODMAP group	Food with a high amount of FODMAP
Fructans and galactans	<p><u>Cereals:</u> Wheat and rye.</p> <p><u>Vegetables:</u> Artichoke, asparagus, beetroot, sprouts, broccoli, onion, cabbage, fennel, garlic, peas, shallot.</p> <p><u>Legumes:</u> Chick-peas, lentils, beans.</p> <p><u>Fruit:</u> Watermelon, apple, peach, Japanese persimmon.</p>
Lactose	Milk (from cow, goat and sheep), ice cream, soft cheeses (cottage cheese).
Fructose	<p><u>Fruit:</u> Apple, pear, peach, mango, garden pea, hermetic fruit, watermelon, dried fruit, fruit juice.</p> <p><u>Sweeteners:</u> Honey, corn syrup.</p>
Polyols	<p><u>Fruit:</u> Apple, apricot, cherry, pear, nectarine, peach, plum, prune, watermelon.</p> <p><u>Vegetables:</u> Avocado, cauliflower, mushroom.</p> <p><u>Sweeteners:</u> Sorbitol, mannitol, isomalt maltitol, xylitol and others with the ending «-ol». Chewing gum and sugar free pastilles.</p>

Phase 1: Strict low FODMAP diet for six weeks

The intake of food rich in lactose, polyols, fructose and the oligosaccharides fructans and galactans should be reduced or avoided in the first period of six weeks. Food with more glucose than fructose can be eaten, but not the other way round (67). It can be a good idea to only eat one food type with restriction in each meal (60).

Phase 2: Reintroduction

After six weeks on a low FODMAP diet, the reintroduction should start (see figure 6). This can be a demanding and complicated process. It is important to introduce the FODMAPs gradually and only one group at a time. If this is done systematically, it is easier to find out what foods that cause problems and what foods that can be eaten safely.

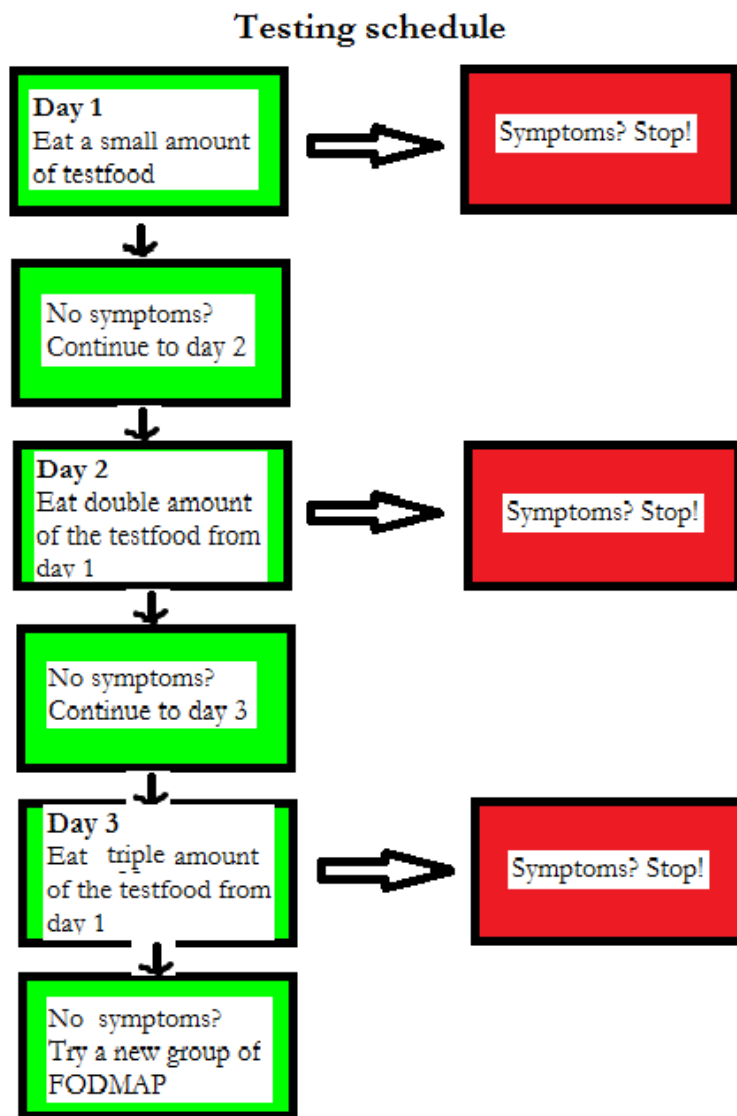


Figure 6: Testing schedule for the reintroduction phase (99).

Figure 6 is showing an example of a testing schedule for how the FODMAPs can be reintroduced (99). If symptoms occur when introducing one of the FODMAPs, the group should be avoided. This does not mean that this food has to be avoided for the rest of the life, so it is important to try again later. On the other hand, if symptoms do not occur after introducing a

FODMAP, the amount should be doubled the next day and symptoms monitored. On day three, the amount can be tripled. If the patient does not get any symptoms after day 3, the FODMAP group is tolerated and can be a part of his/her diet. Then, a new FODMAP group can be tested.

Some foods are more suitable for the reintroduction phase. Here are some examples (100):

- Galactans: 2 tablespoons with beans or lentils
- Fructans: ½ piece of bread (wheat/rye), 1 tablespoon prepared onion, leek or 1 clove garlic
- Lactose: 125 ml milk or 1 slice of brown cheese (15 g)
- Fructose: ¼ mango or 1 teaspoon with honey
- Polyols: 2 dried apricots, 1 sugar free chewing gum or some sugar free pastilles with sorbitol

1.3.4 Evidence basis

In 2006 Shepherd and Gibson did a pilot study with 62 patients with IBS and fructose malabsorption (101). 74% of all the patients in the study responded positively in all abdominal symptoms ($p < 0.01$). In 2008 the first randomized placebo-controlled study on IBS patients with fructose malabsorption came (82). It included 25 patients and found that symptoms were induced in a dose-dependent manner. Fructose and fructans caused more symptoms than placebo (glucose). The conclusion was that a restriction of poorly absorbed short-chain carbohydrates in general is likely responsible for symptomatic improvement in IBS patients.

Another study performed by Staudacher et. al in 2011 did also state that a low FODMAP diet is the ideal IBS diet (85). The researchers compared the traditional IBS-guidelines with low FODMAP diet. The participants who ate a diet low in FODMAPs had a greater improvement in all the typical IBS symptoms (flatulence, abdominal pain, passage of wind, diarrhoea, nausea, fatigue and total), except constipation, than the participants who ate a standard IBS diet. Nevertheless, both diets caused an improvement in symptoms, but the low FODMAP diet had a statistically significant better effect than the traditional IBS diet.

Halmos et. al (2014) did a randomized controlled crossover study including 30 patients with IBS and 8 healthy controls (86). The participants were randomized into two groups; one should be eating a diet low in FODMAPs for 21 days, and the other should eat a typical Australian diet for 21 days, and there was a wash-out period lasting for at least 21 days in both groups - before they exchanged diets. Symptoms were registered. Patients with IBS had less gastrointestinal symptoms (flatulence, abdominal pain, gas production and hydrogen in exhaled air) when they

were eating the diet low in FODMAP compared to the Australian diet. The conclusion was that a low FODMAP diet effectively reduces symptoms and should be used as first-line-therapy in people with IBS.

NICE (National Institute for Health and Clinical Excellence) (102) and other British recommendations (103) also recommend a diet low in FODMAPs for patients with IBS. A study (104) compared traditional dietary IBS-advice and the low FODMAP diet. Symptoms were reduced in both groups, and the researchers concluded that a low FODMAP diet reduces the IBS symptoms as good as traditional dietary IBS-advice.

A recent meta-analysis published in April 2016 supports that a diet low in FODMAPs is a good treatment for functional gastrointestinal symptoms (105).

The most of the studies are done in Australia. One Danish study did also find an effect of the low FODMAP diet on patients having IBS (106). There is probably also a mental component with the effect of the diet (60). There is a need for more studies from our own population and to investigate long-term effects of the low FODMAP diet (17).

1.4 COELIAC DISEASE AND IRRITABLE BOWEL SYNDROME

Till now, I have written about coeliac disease and IBS separately. The patients in our study though, had coeliac disease with residual symptoms compatible with IBS. Patients with for example IBD like Crohn's disease and ulcerative colitis can also have residual symptoms compatible with IBS (IBD-IBS).

The majority of coeliac disease patients will feel symptom relief when adhering to a strict gluten free diet. Nonresponsive coeliac disease is a condition where the patient still feel abdominal symptoms or is having laboratory abnormalities in spite of following a gluten free diet for at least six months (107). Leffler et. al reports that 19% of their coeliac patients have nonresponsive coeliac disease (108). The main reason for still feeling symptoms is not being strict enough and therefore being exposed to gluten (36-51% of the patients) (108-110). Serological testing is useful to predict a potential non-adherence to the diet. Both the duration and the degree of gluten exposure will affect the tests. Other reasons for nonresponsive coeliac disease are IBS-like symptoms (our patients), refractory coeliac disease, lactose intolerance,

pancreatic insufficiency etc.

A study by Stasi et. al (107) found that 21.8% of the patients in their study still had typical coeliac symptoms. They evaluated the cause in 80% of these patients, 15 had normal histology when doing gastroscopy. Out of these, 9 had IBS-like symptoms in addition to their coeliac disease.

Some will therefore still have abdominal symptoms compatible with IBS in spite of eating a gluten free diet (111). One study found that 20-50% fulfilled the Rome III criteria (112, 113), while another found 38% (114) and again a study (108) found that IBS-like symptoms was the cause for having nonresponsive coeliac disease in 22%. The inflammation of the mucosa seen in coeliac disease is thought to predispose for IBS (113), and these patients will likely benefit from a diet low in FODMAPs (67, 86).

1.5 PURPOSE AND OBJECTIVES

Several studies have found an effect of reducing the intake of food rich in FODMAPs when having an irritable bowel. As far as we know, there are no published papers on low FODMAP diet to patients with coeliac disease. The purpose of this project was to investigate whether patients with coeliac disease and IBS-like symptoms could have a benefit on abdominal symptoms and quality of life, from a reduction in FODMAP in addition to their gluten free diet. We also wanted to investigate whether a low FODMAP diet would have any effect on the gut microbiota and the degree of fermentation by gut bacteria, measured with breath tests and stool samples.

The objective was to investigate whether the low FODMAP diet could be a helpful supplementary treatment for coeliac patients with IBS-like symptoms or not.

H_{a1}: A FODMAP reduction in addition to a gluten free diet will give symptom relief and increased quality of life in coeliac disease patients with IBS-like symptoms.

H_{a2}: A FODMAP reduction will affect the microbiota and the degree of fermentation.

2. METHODS AND PATIENTS

2.1 Choice of project, planning and applying to REK

The future master projects were presented by the supervisors 21.11.14. We started to plan the project and the optional subject “Z-K1” with focus on coeliac disease and IBS was created. Scientific protocol (see attachment 12) and information letters (see attachment 13) were made. During the spring, we had meetings, attended the IBS-school and learned how to use the machine for the breath tests.

REK approved our application in July 2015 (see attachment 14). In the autumn 2015, Jan Gunnar Hatlebakk, Gudrun E. Kahrs, Ida Strindmo and I continued to meet for short meetings approximately every second or third Tuesday. I started to read background information and we planned the project.

Implementation and logistics like available rooms, keys, teaching, ordered equipment for breath tests and stool specimens, storage of samples, envelopes for randomization, envelopes and stamps for sending questionnaires, schemes for travel expenses, interpretations of questionnaires etc. were discussed. Jan Gunnar Hatlebakk, Gro Olderøy and Trygve Hausken helped us with this. We also had a meeting with Eva Rosendahl (clinical dietitian working with coeliac disease at Haukeland University Hospital) where we got some advice for the teaching in the more strict gluten free diet without wheat starch and “traces of gluten”. We asked her to contact us if she met some patients who could fit in our study. In April, an abstract was sent to the ESPEN conference in Copenhagen (see attachment 16) and later also to UEGW (see attachment 17) in Vienna.

2.2 The project

The study was an open, prospective, randomized and controlled clinical study carried out in cooperation between the University of Bergen (UiB) and the Medical Department at Haukeland University Hospital in Bergen.

2.3 Recruitment of patients

The objective was to include 40 patients in the study (group A and B). There are approximately

500 000 inhabitants in Hordaland, and about 1% (5000) of these has coeliac disease. Around 20% (1000) of these will statistically also have IBS.

Inclusion criteria:

- Confirmed coeliac disease diagnosis for at least 6 months
- IBS-like symptoms confirmed by the Rome III criteria
- Score > 75 on the IBS-SSS-questionnaire
- 18-75 years of age

Exclusion criteria:

- Subjects with therapy-resistant coeliac disease
- Recent biopsy with abnormal findings
- Relevant comorbidity
- Problems with eating a strict gluten free diet
- Following a low FODMAP diet at the moment
- Following a natural gluten free diet at the moment

Many different methods were used to recruit enough patients:

NCF - The Internet, Facebook and e-mails

An announcement about the project where made and NCF (Norwegian Coeliac Society) was contacted. The announcement was published on NCF's national web page and Hordaland's regional web page. In addition, information about the project was published on NCF's, NCFU's (Norwegian Youth Coeliac Society), NCFU Hordaland's Facebook page and one called "Coeliac disease". NCF Hordaland's and NCFU Hordaland's leaders were asked to e-mail this information to all their members, and it was done to a certain degree. Around 11-15 interested people e-mailed us, they were called and appointments were made. Some changed their minds, others were excluded and the rest included. The purpose was to try to only recruit patients from Hordaland, but after a while we had to include two from Trondheim, one from Oslo and one from Molde to get enough participants. Information was put on my personal Facebook-account and one contacted me, but was not included.

LMS – Earlier participants and waiting lists

LMS (Learning and Mastery Centre in Bergen) at Haukeland University Hospital was contacted and asked if it was possible to get email addresses to all previous participants. LMS is teaching newly diagnosed coeliac patients about the gluten free diet and how to cope with the disease. Unfortunately, we did not get their email addresses, but lists with names back to 2008 and lists for the upcoming courses were collected. In total, there were about 20 lists with 13-20 names on each. All the names were looked up in DIPS (an electronic medical record-system) and the medical records were searched for relevant information. Then, we called all the possible participants which met the inclusion criteria. This was a long process which lasted for many days/weeks. They were asked how it was going and if they still had any abdominal pain, diarrhoea or constipation problems. Most of them were fine and therefore not proper participants for this project. The ones who still had abdominal problems were informed about our project, and told that we would call them back later with more information about start-up. Later, appointments were made.

Waiting lists for LMS's coeliac school and the IBS-school were collected. Again, medical records were checked in DIPS and suitable patients contacted. It was hard to find people who fulfilled the criteria since most of the ones who were called, did not have symptoms anymore.

The Coeliac Disease Outpatient Clinic – Earlier and new referrals

Another strategy for recruiting participants, was lists with patients who were referred back to the coeliac disease outpatient clinic at Haukeland University Hospital. Lists for the rest of 2015 were collected. Again, we checked their medical records and called all the suitable participants. Only four possible participants were called.

All the patients were checked up in DIPS who had been to the coeliac disease outpatient clinic the last year, since 01.01.15. Many of these were not considered possible participants for different reasons: already evaluated, comorbidity like IBD for example, problems with eating a strict gluten free diet, eating a gluten free diet for a short period of time, no abdominal symptoms etc. Ten possible candidates were called.

NCF Hordaland meeting

The project was also presented at a NCF Hordaland meeting 19.09.15. Some said they were interested in participating, but none contacted us later on. We considered attending other happenings arranged by NCF, but found out that a baking course wasn't the right arena to present our project. A request for putting information about the project on the web side was also sent to Semper.

Announcement in newspapers (BT and BA) and posters

Announcements in the newspapers Bergens Tidende and Bergensavisen were published, but the response was unfortunately disappointing. An application was sent to REK VEST with the proposed text before they were printed. The same announcement (see attachment 15) was put on 28 different walls, for example at Rema 1000, Bunnpris, the BBB-building, the Laboratory building, in the cafeteria at the hospital, the student cafeteria, in the medical outpatient clinic, next to different elevators and escalators etc. Approximately 3 people called us after seeing one of these, but only one was included.

2.4 Design

There were two groups in the study; group A which followed a more strict gluten free diet without wheat starch and "traces of gluten", and group B which followed a low FODMAP diet in addition to a traditional gluten free diet (see figure 7).

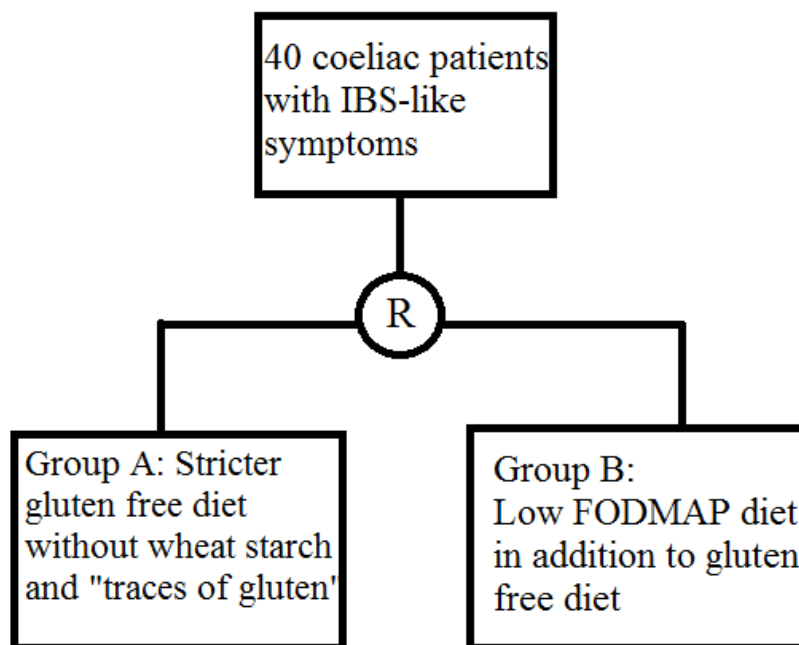


Figure 7: The design

Figure 8 shows a time schedule for the project.

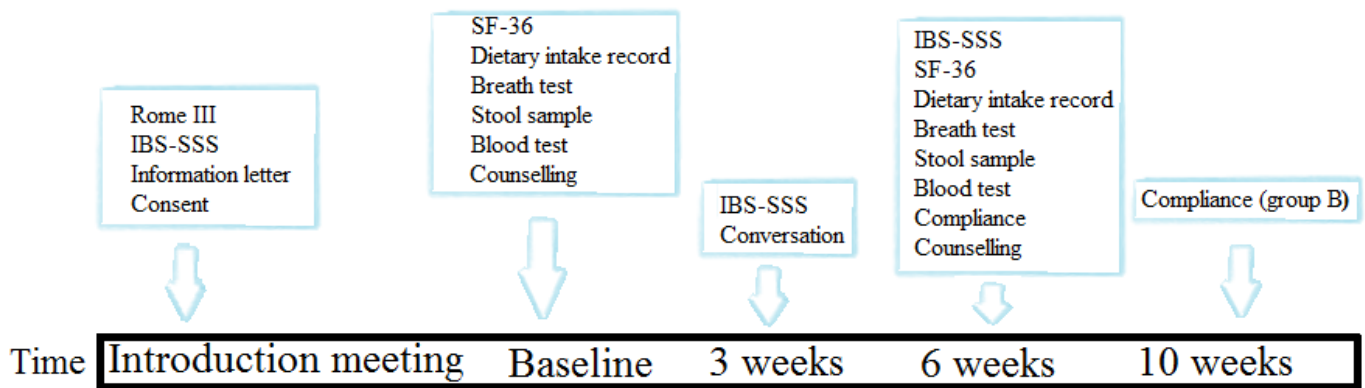


Figure 8: Time schedule.

2.5 Randomization

Randomization was used to split the 40 patients by chance into two treatment groups. This was to avoid bias. The randomization list was based on secret variable block sizes. There should be just as many A's as B's, but we did not know at what number between 40 and 50. The list was made by a person not involved in the study. We got envelopes labelled with numbers, and opened an envelope after including a patient. In this way, we were not able to affect the distribution.

2.6 Implementation

Baseline: The first appointment

The first appointment with each participant lasted for about 15-30 minutes. Usually, we both attended these meetings which were held in the second floor in the central building at Haukeland University Hospital, medical outpatient clinic. The patients were informed about the study; background, objects and design. The patients read the information letter and we emphasized that it would be completely random which of the two groups the patient would end up in and that they could drop out at any time if they changed their minds. Then, both the patient and we signed two information letters, and the questionnaires Rome III and IBS-SSS were filled in by the patient. If the patient fulfilled the criteria for being a participant in the project, we gave information about breath tests and blood tests, and made two new appointments. They were asked to fast for 10 hours before the breath tests which measures the amount of hydrogen and methane in a person's exhaled air. They got equipment and advice for taking a stool specimen and how to fill in a dietary intake record, and we told them to bring this next time. In the

meantime, the participants could contact us anytime if they had questions, both by phone and email.

Baseline: The second appointment

The second meetings were held in the morning between 07.30 and 11.30 because of the fasting. Sometimes we had meetings one and one; other times groups of 2-3 people. Breath tests and blood tests were done, stool specimens and dietary intake records collected, the participants filled in the SF-36 (short-form health survey)-questionnaire and were told which group they were in. Thereafter they got thorough counselling in either a more strict gluten free diet without wheat starch and “traces of gluten” (group A) or low FODMAP diet (group B) without gluten as described in the introduction, and got brochures with information.

The patients in group A were told to continue eating a gluten free diet, to be careful with hygiene and eating outside the house, and be aware of possible contamination sources. In addition they should exclude all wheat starch from their diet and food labelled “traces of gluten”. Wheat starch is cleansed for gluten, but some coeliac patients with a very sensitive bowel can still get symptoms. “Traces of gluten” does not mean that the product consists of gluten; but that the product is made in surroundings where products with gluten also is made, so there is a risk of contamination. This more strict gluten free diet is today’s treatment practice, and we wanted to compare it to a low FODMAP diet, which the patients in group B followed.

A new appointment after six weeks were agreed and the participants got new equipment for a stool sample, dietary intake record and an IBS-SSS questionnaire which should be filled in after three weeks. Again, they were told to contact the master students at any time if they got questions.

3 weeks

All the patients were called 3 weeks after they started on one of the diets to hear how it was going, if they had any benefits from following the diet and they could ask us questions if they had any. They were also reminded about the IBS-SSS questionnaire, the dietary intake record and a new stool sample for the next meeting at six weeks.

6 weeks

These visits were similar to the baseline visits. Breath test and blood test were done and we got a new stool sample and a new dietary intake record. Again, the patients filled in SF-36 and IBS-SSS. They could also fill in a bill for travel expenses if they wanted to. In addition, they filled in a compliance questionnaire which was different dependent on which group they were in.

The patients in group A were offered teaching in the low FODMAP diet and got the same brochure that the patients in group B. Patients in group B were instructed in the reintroduction phase of the FODMAP diet, and told to contact us later if they had any questions.

10 weeks

Patients in group B were also asked to send a compliance form to us after four new weeks (10 weeks after starting on the low FODMAP diet), and got a post-paid envelope for this.

A medical record was written in DIPS to every patient to document their participation in the project and wrote if they had an effect of the diet or if follow-up was needed. This was also sent to their family doctor.

2.7 Methods

2.7.1 Dietary intake record

A dietary intake record measures a person's quantitative food intake, is the gold standard and is very precise (1). The goal is to measure the actual intake, though it is natural that it (and therefore also nutrients) will vary from day to day and also with the time of the year. In our study prospective weighed food records were used. The registration form is developed by the Department of Clinical Nutrition at Haukeland University Hospital (see attachment 7). The patients were supposed to record everything that they had been eating and drinking for four days at two different times; at baseline and after following one of the diets for six weeks. One of the days should be a weekend day because people's eating habits are usually different then. They were told to be as precise as possible and to write down amounts/weights in addition to manufacturer etc. These records were used to calculate the amount of macronutrients, micronutrients and FODMAP in their diet at baseline and after six weeks.

2.7.2 BMR-factor

Basal metabolic rate (BMR) is the energy one needs to sustain metabolic activity of cells and tissues and to maintain blood circulation and respiration when awake. We need 50-65% of our total energy needs to basal metabolism, 10% to thermic effects of food and 30-50% to physical activities. Age, body temperature, stress and hormones can affect BMR. BMR is calculated by different standardized equations from the World Health Organization (115) that consider gender, age, weight and height. BMR-factor is then calculated by dividing energy intake for each person by their BMR. This factor was used to evaluate the degree of underreporting of energy intake in the patients' dietary intake records at baseline.

2.7.3 Blood test

Serological tests were ordered for each patient in DIPS at baseline and after six weeks. We wanted to look at antibodies and nutritional status. 22 different analyses were done: Haemoglobin, MCV (mean cell volume), leukocytes, thrombocytes, cobalamin, folate, ferritin, CRP (C-reactive protein), creatinine, GFR (glomerular filtration rate), sodium, potassium, calcium, ALAT (alanine aminotransferase), ALT (alanine transaminase), GT (gamma-glutamyl transpeptidase), albumin, TSH (thyroid-stimulating hormone), PTH (parathyroid hormone), Vitamin D₃, anti-transglutaminase 2 IgA and anti-deamidated gliadin IgG. The blood tests were performed by bioengineers at the Laboratory for Clinical Biochemistry (LKB) at Haukeland.

2.7.4 Breath test and stool samples

These methods are not described here, because it is done in another Master's Thesis by Ida Strindmo 2016.

2.8 Questionnaires

2.8.1 Rome III criteria for IBS

The Rome III questionnaire was developed by the Rome Foundation in 2006 and is used to diagnose patients with IBS. It has five main questions about abdominal symptoms (see attachment 1). Answering "yes" on the first two questions (1.1 and 1.2) and two of the three following (1.3-1.5) is compatible with the diagnosis (73). Accordingly, there are five supplementary questions and in the end a quantification of IBS symptoms.

In our study, the patients filled in this questionnaire at the first meeting. Their IBS symptoms had to be confirmed by this questionnaire to be included in the study.

2.8.2 IBS-SSS

IBS-SSS is short for Irritable Bowel Syndrome Severity Scoring System and is a standardized and validated (74, 116) questionnaire measuring the severity and frequency of the patient's IBS symptoms (see attachment 2). There are five main questions with a score on a VAS (Visual analogue)-scale from 0-100 mm about abdominal pain severity (2b), abdominal pain frequency (2c), abdominal bloating severity (3), dissatisfaction with bowel habits (4) and interference with daily activities (5). Question 2b, 3, 4 and 5 give a score from 0 to 100, where 0 is no symptoms/very pleased and 100 is severe symptoms/very displeased. Question 2c gives a score from 0-10, which is multiplied by 10. In addition, there are some supplementary questions about other common symptoms like headache, fatigue, nausea, muscle pain etc.

IBS-SSS gives a total score between 0-500, where <75 is remission, 75-175 is mild, 176-300 moderate and >300 severe IBS (116). A reduction in 50 or more in total IBS-SSS score is considered clinically significant and a response to the treatment. In our study, the patients filled in this questionnaire at baseline, after 3 weeks and after 6 weeks. At baseline, they had to score more than 75 in total on question 2b, 2c, 3, 4 and 5 to be included in the study.

2.8.3 SF-36

SF-36 is a questionnaire developed from the Medical Outcomes Study (MOS) and is an abbreviation for The Short Form (36) Health Survey. The second version translated to Norwegian was used in this study. It has 36 questions about physical and mental health (see attachment 3). There are questions about the patient's activity level, general health, severity of symptoms etc. It is used to get a picture of how the patient's quality of life is affected by different diseases and is generic meaning that it can be used for different ages and diseases. The patients get two main scores - physical and mental, and in addition 8 dimensions. The 8 dimensions are physical functioning, role-physical, bodily pain, general health, vitality, social functioning, role-emotional and mental health. By using formulas where the different questions and dimensions are weighed different, the first four aspects together give the physical component summary (PCS), and the last four give the mental component summary (MCS). The participants are scored between 0 and 100 in each of the eight dimensions, where 0 is the lowest

HRQOL (health related quality of life), and 100 the highest. This method is considered valid in many studies (117-120). In our study, the patients filled in this questionnaire at baseline and after six weeks.

2.8.4 Compliance with low FODMAP diet (group B)

A compliance questionnaire made by previous master students in clinical nutrition was used to assess adherence to the low FODMAP diet through the 6 weeks in group B (see attachment 5). There were questions about the effect, accuracy, if they want to continue following the diet, deviation, extent and reason for deviation etc. Three of the questions had a VAS-scale from 0-100. They also got a questionnaire about compliance four weeks after finishing the first phase of the diet (see attachment 6), and were asked to send it to us by mail. This questionnaire included questions about compliance, reasons for quitting the diet (if they quitted), the reintroduction phase etc.

2.8.5 Compliance with a more strict gluten free diet (group A)

Based on the compliance questionnaire for the low FODMAP diet mentioned above, we made a similar for the more strict gluten free diet through the 6 weeks (see attachment 4). There are questions about effect, accuracy, if they want to continue following this diet, deviations, extent and reason for deviation etc. Three of the questions had a VAS-scale from 0-100.

2.9 Delivered information

Patients in group A got the brochure “Kostråd til deg som skal spise glutenfritt” developed by the Department of Clinical Nutrition at Haukeland (see attachment 8) (41). In this brochure the patients could read more about coeliac disease, a gluten free diet, find lists of gluten free ingredients and products, list of ingredients containing gluten, advice and recipes. In addition, they got a list with products without wheat starch and the labelling “traces of gluten”, at baseline (see attachment 9).

Patients in group B got the brochure “Kostråd ved irritabel tarm, FODMAP redusertkost» also developed by the Department of Clinical Nutrition at Haukeland, but done gluten free by us, at baseline (99). This brochure was also given to patients in group A after six weeks (see attachment 10). In this brochure the patients could read more about the background for the diet and the different phases. There are also lists with «yes» and «no»-food, alternatives and recipes, which makes it easier to go through such a diet. The patients in group B also got a list with

ingredients which are gluten free, but still high in FODMAP (inulin, apple fibre, oligo fructose etc.), at baseline. There was also a list with products which are both gluten free and low FODMAP (see attachment 11). We also informed about books and an application for smart phones.

2.10 Dietist Net Free and the Factory Table

All the data from the dietary intake records were entered into Dietist Net Free delivered by «Kost och Näringsdata AB» in Sweden. This is a program for nutrient calculation based on the Norwegian “Matvaretabellen”, the Danish “Fødevaredatabanken” and the Swedish “Livsmedelsverkets database”. The free version was used to calculate the amount of total FODMAPs in the patient’s diet at baseline and after six weeks after following a diet. In addition the intake of lactose and non-lactose FODMAPs were looked at. FODMAP contents in different foods were not in this database before, so we had to make our own database. Australian studies (121, 122) were used and also some Danish and Norwegian data (123, 124) and some American (125). The data were first entered into Excel and then into the Factory Table which was linked to Dietist Net Free. There are no data on FODMAP content in composite products like pizza, lasagne and sauces. Standard recipes from www.matprat.no were therefore used for estimations (126). The content in spices, hot dogs and liver paste were not included because of secret recipes, and the data would therefore be unprecise.

2.11 Kostholdsplanleggeren

Kostholdsplanleggeren is a tool for assessing the amount of energy, macronutrients (carbohydrates, dietary fibre, fat, proteins) and micronutrients (vitamins and minerals) in a person’s diet. All the dietary intake records (four days each at baseline and 6 weeks) from all the participants in the two groups were put in this program, and nutrition facts came out.

2.12 Data analyses

All the raw data from the questionnaires (Rome III, IBS-SSS, SF-36, compliance), the dietary intake records, blood tests, breath tests and stool samples were plotted into Microsoft Excel. In Excel, means were calculated and values compared between the different groups and also at different time points. The data were then copied to and analysed in the statistical program GraphPad Prism 6 which is developed by GraphPad Software Inc., San Diego, California, USA. The p-value had to be <0.05 to be called statistically significant.

D'Agostino & Pearson omnibus normality test was used on all the data to check if it were normally distributed. Normally distributed data were analysed with paired t-tests when having matching pairs of data in one group (baseline and 6 weeks from group A or group B), and unpaired t-tests when having two separate sets of data (from group A and from group B at baseline or 6 weeks). RM one-way ANOVA with Geisser-Greenhouse correction assuming no sphericity was used to find the trend when having three or more time points, sometimes with Tukey's multiple comparisons test.

Non-parametric data were analysed with Wilcoxon matched-paired test (paired data), Mann-Whitney test (unpaired data) or Friedman when having three or more time points, sometimes with Dunn's multiple comparisons test. The F statistics is found by dividing the variance between the groups by the variance inwards a group. A high Friedman statistics means that the treatment has a good effect.

Chi-squared test was used for categorical data, and Fishers exact test when there were numbers lower than 5 in at least one of the boxes.

Correlation analyses were performed. Pearson test was used when the data were normally distributed and Spearman test when they were not.

Outliers were checked for in all the data sets by using the ROUT-method in Prism, Q= 1%. After removing the outliers, the normality test was repeated and the new p-value compared to the old. Nevertheless, all the extreme values were included since the patient group is heterogenic.

Two different methods were used to calculate scores from SF-36. First, all the data from every questionnaire were put in an electronical calculator: <http://www.sf-36.org/demos/SF-36v2.html> (127). Scores for the eight dimensions and the two main categories were calculated. These scores can be used to look at differences before and after an intervention, but the calculator does not adjust for age and sex. These scores can therefore not be used to compare with other studies and are not presented here. Thereafter, all the answers from all the questionnaires with different numbers of alternatives were entered into Excel. For some of the questions answering "1" is the worst alternative and for example "5" the best, while it is the opposite for other questions. The latter questions were therefore recoded in such a way that all the answers were comparable; (1=5, 2=4, 3=3, 4=2, 5=1) for example. Then, different syntaxes were used in Excel to calculate the scores from 0 (the worst) -100 (the best) for all the eight dimensions. There were 10

questions for “physical function”, 4 for “physical role”, 2 for “bodily pain”, 5 for “general health”, 4 for “vitality”, 2 for “social function”, 3 for “role emotional” and 5 for “mental health”. As an example, the formula for scoring general health is shown:

$$GH = ((\text{question 1} + \text{question 11a} + \text{question 11b} + \text{question 11c} + \text{question 11d} - 5) / 20) * 100.$$

Then, to be able to compare the scores with other studies and normal values for the Norwegian population, other formulas were used in SPSS to make norm based scores where 50 is the mean and 10 the standard deviation in a general population (128, 129). Each of the scores for every patient was compared to what is normal in a general population when age and sex were taken into consideration. Again, the formula for scoring the norm based score for general health is shown:

$$GH = 50 + 10 * (\text{actual score} - \text{normal score}) / 21.72,$$

where 21.72 is the standard deviation of the scores for general health in the general population (scale 0-100).

Formulas in SPSS were also used to calculate PCS and MCS. General health is still used as an example. Z-scores were first calculated:

$$GH = (\text{score for general health} - 72.21) / 20.17.$$

Then, formulas (not shown) in three steps were used to calculate norm based scores for PCS and MCS and again compared to what is normal in a general population when age and sex were adjusted for (128, 129).

2.13 Ethics

The study was approved by REK and there was no risk of getting personal injury or health damages in this study. The intervention and the data collection might be perceived as demanding for some, but it would not cause any harm. The study was voluntarily, they signed an informed consent and the participants could withdraw from the study at any point without providing any

justification.

3. RESULTS

3.1 Patient responses

We included 40 patients in the study, 20 in each group. One did not meet the Rome III or IBS-SSS criteria and were therefore not included, while three dropped out. Sixteen people were recruited from the Internet; from announcements on NCF's homepages, Facebook-pages and e-mails. Eight people were included from the coeliac disease outpatient clinic, seven from the coeliac school and four from the IBS-school. Further three were included after seeing the announcements in the newspapers, one after seeing a poster and one by the word of mouth (see figure 9).

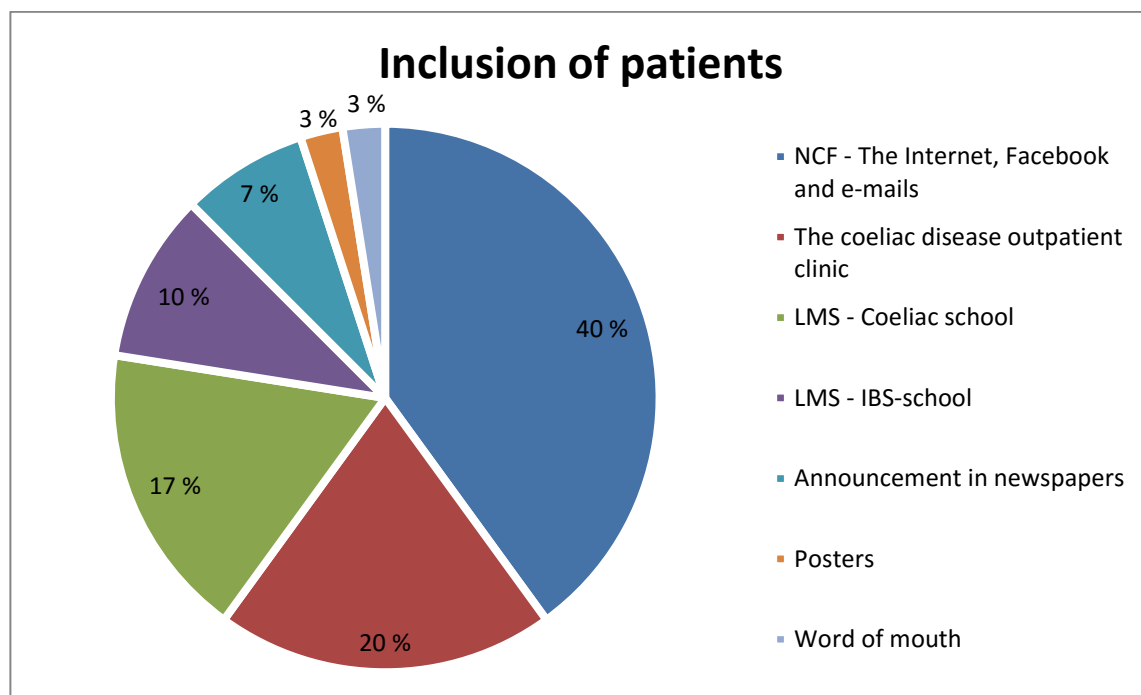


Figure 9: The number of patients included from the Internet, the coeliac disease outpatient clinic, LMS, announcements and the word of mouth.

3.2 Demography

It was clearly more women in the study (82.5%) than men (17.5%) and the mean age was 41 years. The youngest participant was 22 years old and the oldest 73 years old. The median BMI was 23.2 kg/m² in the total group, while the lowest was 17.8 kg/m² and the highest 43.2 kg/m². 42.5% of the patients had constipation problems (IBS-C), 27.5% diarrhoea problems (IBS-D) and 30% both (IBS-M). In total, the mean total IBS-SSS score was 262 and none were in remission at baseline. 15% had mild IBS, 55% moderate and 30% severe IBS-like symptoms. Regarding quality of life, 44.7 (PCS) and 47.1 (MCS) were the mean scores for the total group. The mean BMR-factor was 1.39 and 11.1 g/day the median FODMAP intake. 6 patients had raised anti-transglutaminase 2 IgA-levels at baseline and 5 had raised anti-deamidated gliadin IgG-levels.

There were no statistically significant differences in the baseline characteristics between the two groups (see table 2), which means that the randomization was successful. There were 18 women in group A and 15 in group B, whereas 2 men in group A and 5 men in group B. The mean age in group A was 39 years and 43 years in group B. The median BMI in group A was 23.0 kg/m² and 23.3 kg/m² in group B. The mean total IBS-SSS score in group A was 260 and 263 in group B. The mean physical component score in group A was 44.9 in group A and 44.5 in group B at baseline, while the mean mental component score was 47.3 and 46.9 respectively.

The mean BMR-factor for group A was 1.42 and for group B it was 1.35. The median FODMAP intake in group A was 14.5 g/day, while it was 7.7 g/day in group B. Five patients in group A and one in group B had raised anti-transglutaminase 2 IgA-levels at baseline, while two and three respectively had raised anti-deamidated gliadin IgG-levels.

Table 2: Baseline characteristics in 40 patients with coeliac disease and IBS-like symptoms. An overview of sex, age, BMI, IBS subtype, total IBS-SSS score, severity of IBS, PCS, MCS, BMR-factor, total FODMAP intake, raised anti-transglutaminase 2 IgA- and anti-deamidated gliadin IgG-levels for group A and B. Unpaired t-tests are used for normal distributed data which are given in mean±SD, Mann-Whitney tests for non-normal which are given in median (IQR), Chi squared test and Fishers exact tests for categorical data.

	Group A (n=20)	Group B (n=20)	P-value
Sex, n	Women: 18 Men: 2	Women: 15 Men: 5	0.408
Age, mean ± SD	39 ± 15	43 ± 12	0.308
Age, min-max (range)	23-73	22-61	
BMI, median (IQR)	23.0 (21.5-27.3)	23.3 (20.3-26.1)	0.654
BMI, min-max (range)	18.8-34.7	17.8-43.2	
IBS subtype, n	Constipation: 9 Diarrhoea: 7 Mixed: 4	Constipation: 8 Diarrhoea: 4 Mixed: 8	0.331
Total IBS-SSS score, mean ± SD	260 ± 90	263 ± 70	0.889
Severity of IBS, n	Remission: 0 Mild: 4 Moderate: 9 Severe: 7	Remission: 0 Mild: 2 Moderate: 13 Severe: 5	0.422
PCS, mean ± SD	44.9 ± 8.3	44.5 ± 8.1	0.886
MCS, mean ± SD	47.3 ± 7.5	46.9 ± 8.0	0.850
Energy intake, (kcal/day), mean ± SD	2051 ± 609	2043 ± 492	0.960
BMR-factor, mean ± SD	1.42 ± 0.45	1.35 ± 0.31	0.585
Total FODMAP intake, (g/day), median (IQR)	14.5 (10.9-21.6)	7.7 (2.7-19.2)	0.0786
Raised anti-transglutaminase 2 IgA-levels, n	5	1	0.182
Raised anti-deamidated gliadin IgG-levels, n	2	3	1

SD= standard deviation, BMI= body mass index, IQR= interquartile range, IBS=irritable bowel syndrome, IBS-SSS= irritable bowel syndrome-symptom severity scale, PCS= physical component score, MCS= mental component score, BMR= basal metabolic rate, FODMAP=fermentable oligo-, di-, monosaccharides and polyols.

3.3 Dietary intake record

In group B there were statistically significant reductions in total FODMAP intake (p=0.0001), lactose (p<0.0001) and non-lactose FODMAPs (p<0.0001) from baseline to 6 weeks, but not in group A (see figure 10). The median intake of total FODMAP in group B at baseline was 7.7 g/day, while it was reduced to 1.3 g/day at six weeks. In group A it was 14.5 g/day at baseline and 12.1 g/day at six weeks. There were no statistically significant differences in total FODMAP intake, lactose or non-lactose FODMAPs between the two groups at baseline (p=0.0786), but

after six weeks there were ($p < 0.0001$, $p < 0.0001$, $p = 0.0299$) (see table 3 and figure 11).

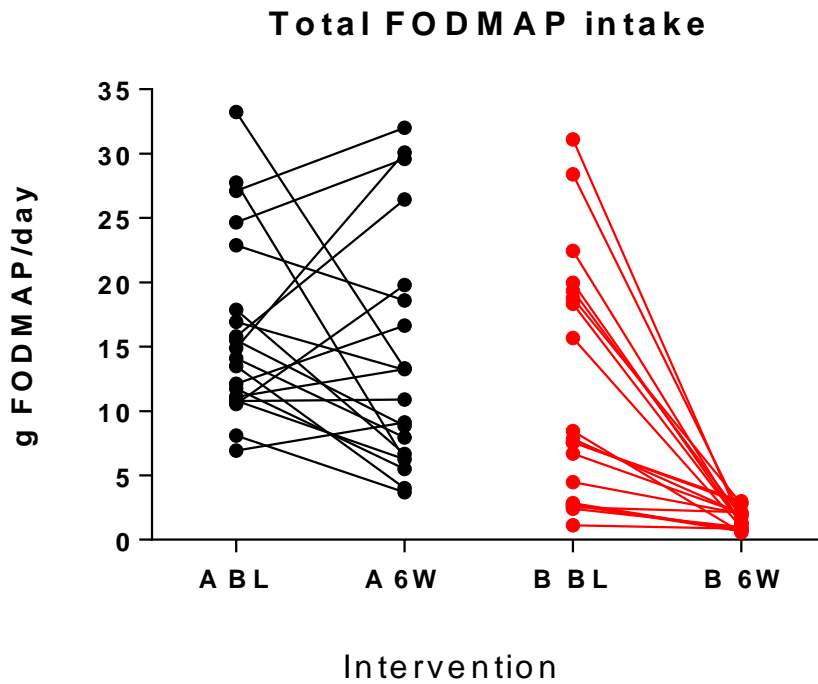


Figure 10: Total FODMAP intake in g/day at baseline and at six weeks for every patient in group A and B.

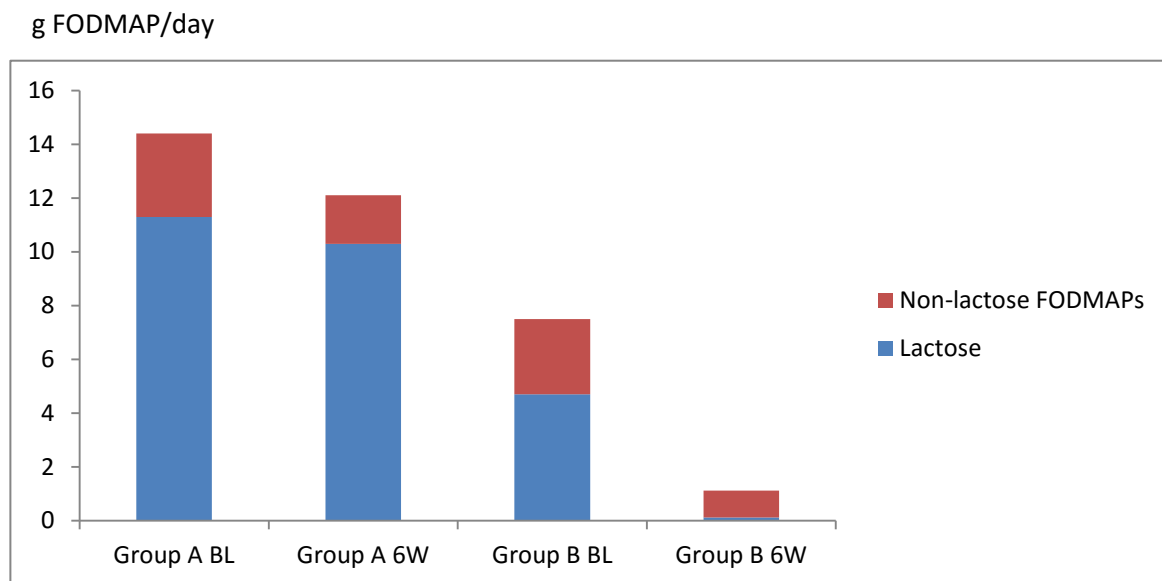


Figure 11: Intake of total FODMAPs and distribution of lactose and non-lactose FODMAPs in g/day eaten by the patients in group A and B at baseline and at six weeks. Lactose is the FODMAP group that dominates in both groups.

There was no statistically significant reduction (but a reduction) in energy intake from baseline to six weeks in group A ($p=0.119$), but in group B ($p=0.0134$). The mean intake at baseline was 2043 kcal/day for group B and 1807 kcal/day at six weeks. There were no statistically significant differences between the two groups at baseline ($p=0.961$) or at six weeks ($p=0.912$) (see table 3).

The intake of carbohydrates, dietary fibre and calcium was not statistically significant different at the different time points in any of the groups and not between them. Fat intake was significantly lower at 6 weeks in both groups, but no statistically significant difference between the groups was found ($p=0.187$ at baseline and $p=0.134$ at 6 weeks). The protein intake was statistically significant lower at 6 weeks in group A than at baseline ($p=0.048$). There were no statistically significant differences between the protein intake in group A and B at baseline ($p=0.394$), or at 6 weeks (0.0854).

Table 3: Information from the dietary intake records given in kcal, gram or milligram for group A and B at baseline and at six weeks. Paired and unpaired t-tests were used for normally distributed data which are given in mean \pm SD, and Wilcoxon tests and Mann-Whitney for non-normal, which are given in median (IQR).

		Baseline	6 weeks	p-value	Reference value
Energy, kcal	A	2051 \pm 609	1790 \pm 503	0.119	1465.9 ¹
	B	2043 \pm 492	1807 \pm 448	0.0134*	1525.4 ¹
Carbohydrates, g	A	269.4 \pm 94.9, 52.5 E%	230.4 \pm 75.7, 51.5 E%	0.127	45-60 E%/day
	B	227.0 \pm 57.3, 54.0 E%	206.8 \pm 72.1, 46.0 E%	0.0719	
Dietary fibre, g	A	18.8 \pm 6.8	16.5 \pm 5.1	0.0973	25-35 g/day
	B	20.7 \pm 6.5	19.1 \pm 8.4	0.149	
Fat, g	A	80.5 \pm 31.3, 35.3 E%	64.2 \pm 24.4, 32.3 E%	0.0328*	25-40 E%/day
	B	92.9 \pm 27.1, 40.8 E%	75.3 \pm 21.3, 37.9 E%	0.0134*	
Protein, g	A	81.3 \pm 30.7, 5.9 E%	70.7 \pm 21.2, 15.8 E%	0.0483*	10-20 E%/day
	B	89.2 \pm 27.3, 7.4 E%	82.3 \pm 20.4, 18.4 E%	0.221	
Calcium, mg	A	802 (587-1109)	778 (507-986)	0.231	800 mg/day
	B	832 (504-1044)	814 (728-970)	0.929	
Total FODMAP, g	A	14.5 (10.9-21.6)	12.1 (6.4-19.5)	0.522	
	B	7.7 (2.7-19.2)	1.3 (0.9-2.1)	0.0001*	
Lactose, g	A	11.3 (7.6-17.3)	10.3 (4.8-15.4)	0.784	
	B	4.7 (1.2-16.4)	0.12 (0.1-0.3)	<0.0001*	
Non-lactose FODMAPs, g	A	3.1 (1.8-5.5)	1.8 (0.8-3.2)	0.202	
	B	2.8 (1.6-3.1)	1.0 (0.6-1.7)	<0.0001*	

¹ Mean BMR is calculated at baseline in each of the two groups with regard to sex, age, weight and height.

3.4 BMR-factor

BMR-factor was used to evaluate the degree of underreporting of energy intake in the patients' dietary intake records at baseline. There is a cut-off limit at 1.35 (130). BMR-factors under this limit are too low to maintain the energy that the person needs and therefore suggests underreporting of energy intake. 9 patients in group A (45%) and 9 in group B (45%) had BMR-factors under the cut off limit, and there was no statistically significant difference between the two groups ($p=0.585$). The mean BMR-factor though is over the cut-off limit for both groups (1.42 for group A and 1.35 for group B) (see table 4).

Table 4: Mean \pm SD BMR-factor (energy intake/BMR) and number of patients with BMR-factor under the cut-off limit, at baseline for group A and group B. Unpaired t-tests were used because of normally distributed data.

	Group A	Group B	p-value
BMR-factor baseline	1.42 \pm 0.45	1.35 \pm 0.31	0.585
BMR-factor <cut-off limit, n	9 (45%)	9 (45%)	1.0

3.5 Symptoms (IBS-SSS)

The patients filled in the IBS-SSS questionnaire at baseline, during the diet at 3 weeks and at the end of the diet at 6 weeks.

3.5.1 Total IBS-SSS score:

The total IBS-SSS score (0-500) is found by adding the five main questions. In group A the mean baseline total IBS-SSS score was 259.8 and 263.3 in group B (see table 5 and figure 12). There were statistically significant reductions from baseline to 6 weeks in both groups ($p=0.0022$ for A and <0.0001 for B). The reductions were also statistically significant in group B from baseline to 3 weeks and from 3 weeks to 6 weeks, but not in group A. There was no statistically significant difference between group A and B at baseline ($p=0.890$) or at 3 weeks ($p=0.402$), but at 6 weeks ($p=0.025$).

Table 5: Total IBS-SSS score at baseline, 3 weeks and 6 weeks for group A and group B. The scores are given in mean \pm SD from 0 to 500. The data are normally distributed, so RM-one-way ANOVA is used inwards the two groups and unpaired t-tests between the two groups.

	Group A	Group B
Baseline, mean (SD)	260 \pm 90	263 \pm 70
, min-max	95-440	150-406
3 weeks, mean (SD)	225 \pm 99	199 \pm 99
, min-max	61-415	29-419
6 weeks, mean (SD)	204 \pm 76	145 \pm 84
, min-max	46-325	33-347

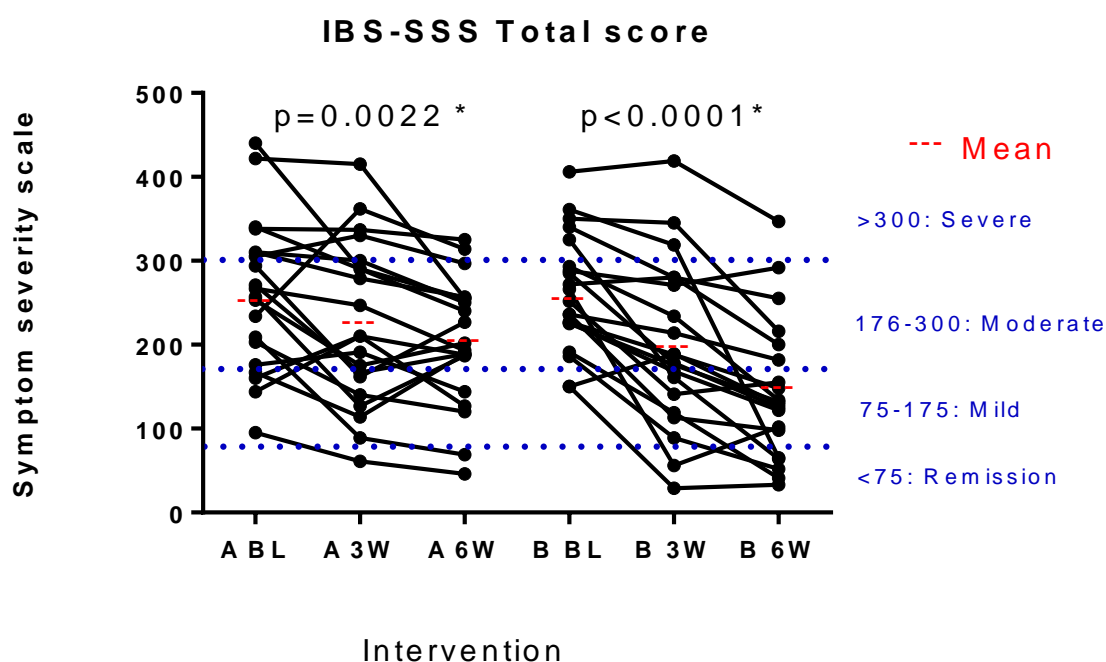


Figure 12: IBS-SSS total score for every patient at baseline, 3 weeks and 6 weeks for the different patients in group A (n=20) and group B (n=20).

3.5.2 Reduction in total IBS-SSS score

The total IBS-SSS score was reduced with 56.1 in group A from baseline to six weeks, while with 118.7 in group B. Twelve (60%) of the patients in group A reduced their total IBS-SSS score with more than 50 from baseline to six weeks, while seventeen (85%) did it in group B (see table 6).

Table 6: Reductions in total IBS SSS score from baseline to three weeks, from three to six weeks and total from baseline to six weeks in group A and B, given in mean \pm SD.

	Group A	Group B
Baseline to 3 weeks	-35.0 \pm 72.5	-64.8 \pm 62.3
3 weeks to 6 weeks	-21.1 \pm 53.9	-53.9 \pm 64.2
Total (baseline to 6 weeks)	-56.1 \pm 65.3	-118.7 \pm 74.3

Unpaired t-test was done to check if the patients with IBS-D and IBS-C in group B had different reductions in abdominal symptoms after following the low FODMAP diet, measured by IBS-SSS. No statistically significant difference was found ($p=0.240$), but the mean reduction for patients with IBS dominated by diarrhoea was greater (-163.2 ± 60.9) than for the constipated patients (-110.4 ± 84.9). No statistically significant difference was found in group A neither ($p=0.914$), but the difference between IBS-D and IBS-C was smaller here (-66.3 ± 52.3 vs. -62.9 ± 65.8).

3.5.3 Severity of IBS

After 6 weeks, 2 in group A and 5 in group B were in remission. 4 in group A and 2 in group B had mild symptoms at baseline, 3 and 9 after six weeks. The number of patients with moderate symptoms went from 9 and 13 at baseline to 13 and 5 after six weeks, and severe was reduced from 7 and 5 to 2 and 1 (see table 7). There was not a statistically significant difference between the groups at baseline ($p=0.422$), but after six weeks it was ($p=0.0425$).

Table 7: Numbers of patients having remission, mild, moderate and severe IBS at baseline and after six weeks in group A and B. Chi-squared test was used.

	Baseline A	Baseline B	6 weeks A	6 weeks B
Remission: <75	0	0	2	5
Mild: 75-175	4	2	3	9
Moderate: 176-300	9	13	13	5
Severe: >300	7	5	2	1

3.5.4 The 5 main questions:

There was a numerical reduction from baseline to six weeks in all the five main symptoms in group A, but only the question about abdominal pain severity was statistically significant (see table 8).

Table 8: Scoring for each of the five main questions at baseline, 3 weeks and 6 weeks for group A. The data are normally distributed, but are given in median (IQR) to be comparable to group B.

2b, 3, 4 and 5: 0-100. 2c: 0-10. RM-one-way ANOVA-test is used for each of the five questions.

Group A	Baseline	3 weeks	6 weeks	Reduction	p-value
2b: Abdominal pain severity	51.1 (27.3-69.5)	38.5 (0.0-59.5)	25.5 (0.0-48.8)	25.6	0.0015*
2c: Abdominal pain frequency	4.0 (2.0-6.0)	3.5 (0.3-9.0)	3.0 (1.3-5.0)	1.0	0.374
3: Abdominal bloating severity	53.0 (32.5-77.8)	50.0 (24.0-65.3)	40.5 (26.8-63.5)	12.5	0.243
4: Dissatisfaction with bowel habits	69.0 (46.8-92.8)	55.5 (30.8-79.8)	50.0 (45.3-71.0)	19.0	0.0724
5: Interference with daily activities	56.5 (29.0-82.8)	55.0 (25.0-74.3)	50.0 (27.8-66.8)	6.5	0.155

In group B, there are statistically significant reductions in all the five main questions from baseline to 6 weeks (see table 9).

Table 9: Scoring for each of the five main questions at baseline, 3 weeks and 6 weeks for group B. The data for question 2c, 2b and 3 are not normally distributed, and therefore all the data are presented with median (IQR). 2b, 3, 4 and 5: 0-100. 2c: 0-10. RM-one-way ANOVA-test is used for normally distributed data and Friedman test for non-normal.

Group B	Baseline	3 weeks	6 weeks	Reduction	p-value
2b: Abdominal pain severity	41.0 (28.8-52.5)	24.5 (2.5-35.3)	14.5 (0.0-23.5)	26.5	<0.0001*
2c: Abdominal pain frequency	4.0 (2.3-7.0)	3.3 (1.0-5.8)	2.0 (0.0-4.0)	2.0	0.0016*
3: Abdominal bloating severity	60.0 (44.0-72.8)	35.0 (20.3-57.5)	19.5 (2.0-34.5)	40.5	<0.0001*
4: Dissatisfaction with bowel habits	61.5 (41.5-88.5)	50.5 (19.5-68.0)	43.5 (27.0-56.5)	18.0	0.0196*
5: Interference with daily activities	57.5 (40.5-84.5)	46.0 (23.8-64.0)	24.0 (15.8-45.5)	33.5	<0.0001*

When comparing the two treatment groups, all the symptom scores at six weeks were numerical lower and the reductions in all the five main symptom-scores were greater in group B than in group A, except for question 4 (19.0 vs. 18.0). The differences between the groups were statistically significant in question 2b (p=0.0016), 3 (p=0.0029) and 5 (p=0.0213), but not in question 2c (p=0.456) and 4 (p=0.0678). The difference in reduction in abdominal pain severity is not that big between the two groups (25.6 in A and 26.5 in B), but the median scores at six weeks are. In question 2c the difference in reductions was 10.0, 1.0 in question 4 and 27.0 in question 5. The biggest difference was regarding question 3 about abdominal bloating severity, with 28.0 in difference.

3.5.5 Abdominal pain severity (question 2b)

At baseline in group A the median for abdominal pain severity (question 2b) was 51.1, at 3 weeks 38.5 and 25.5 at 6 weeks. When using Tukey multiple comparisons test (normally distributed data), a statistically significant change from baseline to three weeks or from three weeks to six weeks was not found, but from baseline to six weeks (25.6, $p=0.0015$).

In group B, the median was 41.0 at baseline and was reduced to 24.5 at three weeks and 14.5 at 6 weeks. When using Dunn's multiple comparisons test (non-normal data), a statistically significant change from baseline to three weeks and from baseline to six weeks (26.5, $p<0.0001$, Friedman statistic=20.55) was found, but not from three to six weeks. The reduction was highest from baseline to three weeks (see figure 13).

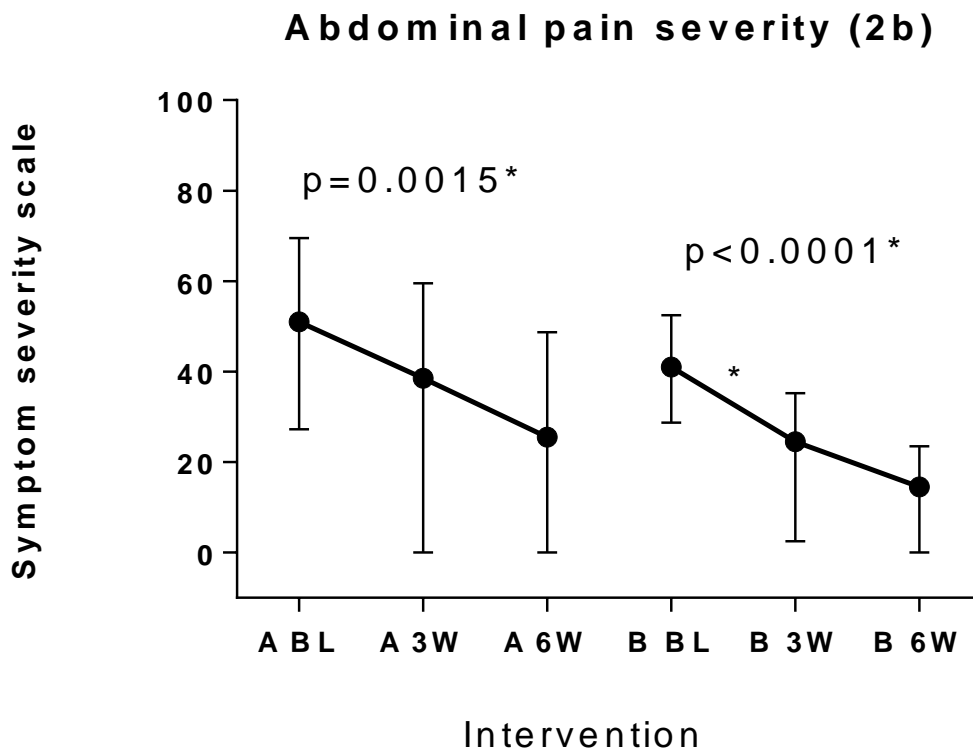


Figure 13: Median scores with IQR for abdominal pain severity (question 2b) at baseline, 3 weeks and 6 weeks in group A and B. Scores from 0-100.

3.5.6 Abdominal pain frequency (question 2c)

In group A the median in abdominal pain frequency went from 4.0 days at baseline to 3.0 days at 6 weeks and there was not a statistically significant reduction from baseline to three and six weeks (1.0, $p=0.374$). The median for group B was 4.0 days at baseline and 2.0 days at 6 weeks, and when using Dunn's multiple comparisons test (non-normal data), a statistically significant change from baseline to three weeks or from three to six weeks was not found, but from baseline to six weeks (2.0, $p<0.0016$, Friedman statistic=12.90). The reduction was highest from three to six weeks (see figure 14).

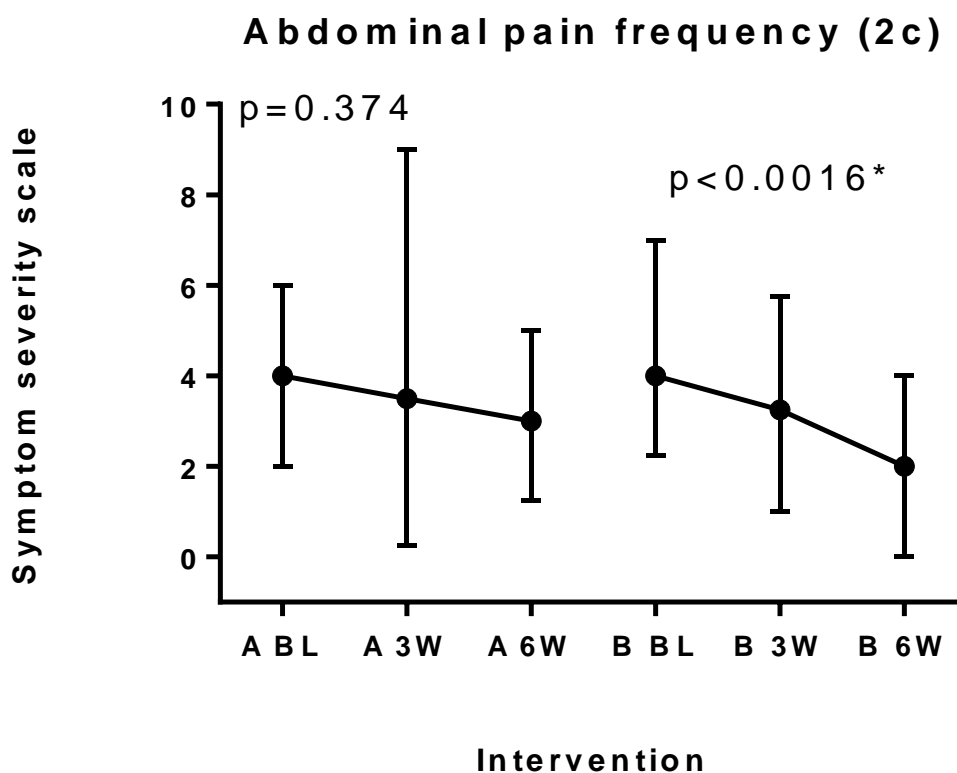


Figure 14: Median scores with IQR for abdominal pain frequency (question 2c) at baseline, 3 weeks and 6 weeks in group A and B. Scores from 0-10.

3.5.7 Abdominal bloating severity (question 3)

In group A the median in abdominal bloating severity went from 53.0 at baseline to 40.5 at 6 weeks, but the reduction was not statistically significant (12.5, $p=0.243$). The median in group B at baseline was 60.0 and 19.5 at 6 weeks and when using Dunn's multiple comparisons test (non-normal data), a statistically significant change from baseline to three weeks was not found, but from baseline to six weeks and from three weeks to six weeks (40.5, $p<0.0001$, Friedman statistic=22.16). The reduction was highest from baseline to three weeks (see figure 15).

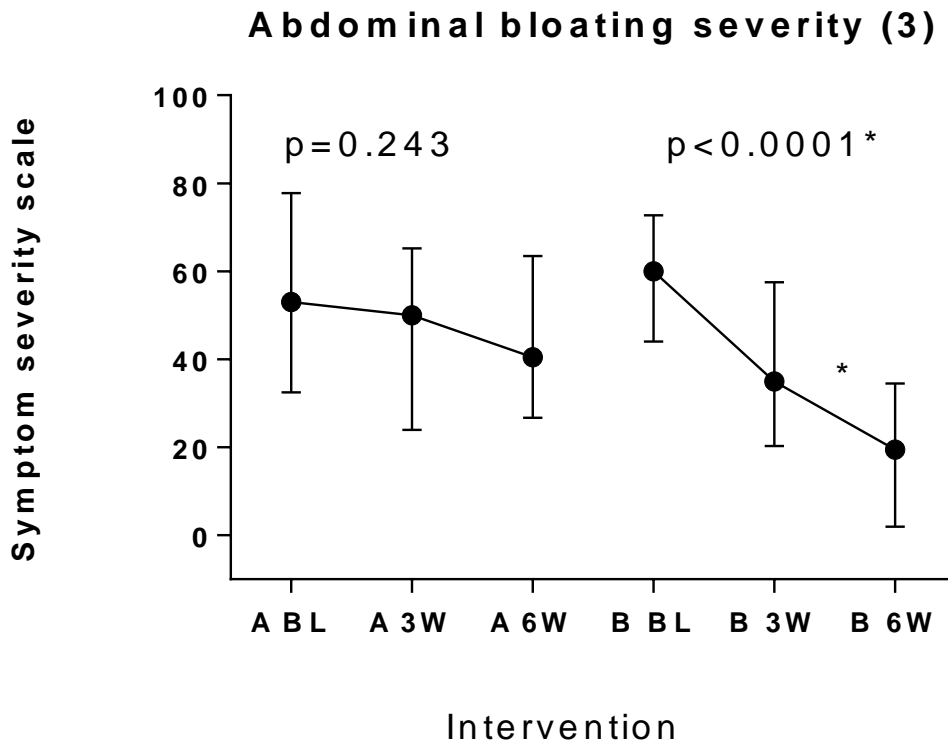


Figure 15: Median scores with IQR for abdominal bloating severity (question 3) at baseline, 3 weeks and 6 weeks in group A and B. Scores from 0-100.

3.5.8 Dissatisfaction with bowel habits (question 4)

In group A the median in “dissatisfaction with bowel habits” went from 69.0 at baseline to 50.0 at six weeks, and there was no statistically significant reduction from baseline to three or six weeks (19.0, $p=0.0724$). The median in group B reduced from 61.5 at baseline to 43.5 at six weeks and when using Tukey multiple comparisons test (normally distributed data), a statistically significant reduction from baseline to three weeks or from three to six weeks was not found, but from baseline to six weeks (18.0, $p=0.0196$). The reduction was highest from baseline to three weeks in group B (see figure 16).

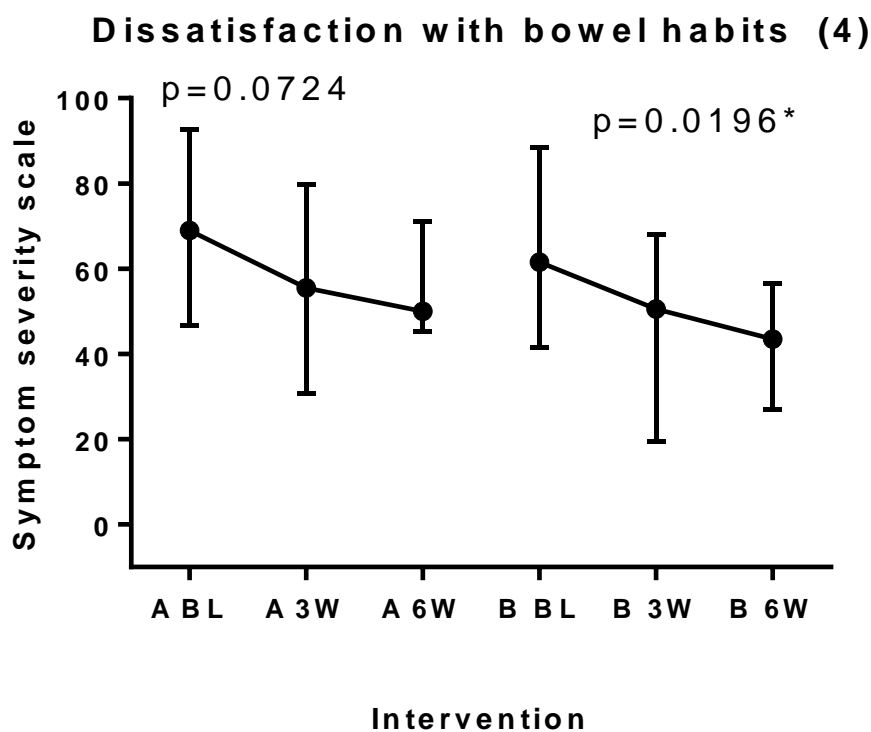


Figure 16: Median scores with IQR for dissatisfaction with bowel habits (question 4) at baseline, 3 weeks and 6 weeks in group A and B. Scores from 0-100.

3.5.9 Interference with daily activities (questions 5)

In group A the median in “interference with daily activities” went from 56.5 at baseline to 50.0 at 6 weeks, and there was no statistically significant reduction from baseline to three and six weeks (6.5, $p=0.155$). The median in group B reduced from 57.5 at baseline to 24.0 at 6 weeks and when using Tukey multiple comparisons test (normally distributed data), statistically significant reductions from baseline to three weeks, from three to six weeks and also from baseline to six weeks (33.5, $p<0.0001$) were found. The reduction was highest from baseline to three weeks (see figure 17).

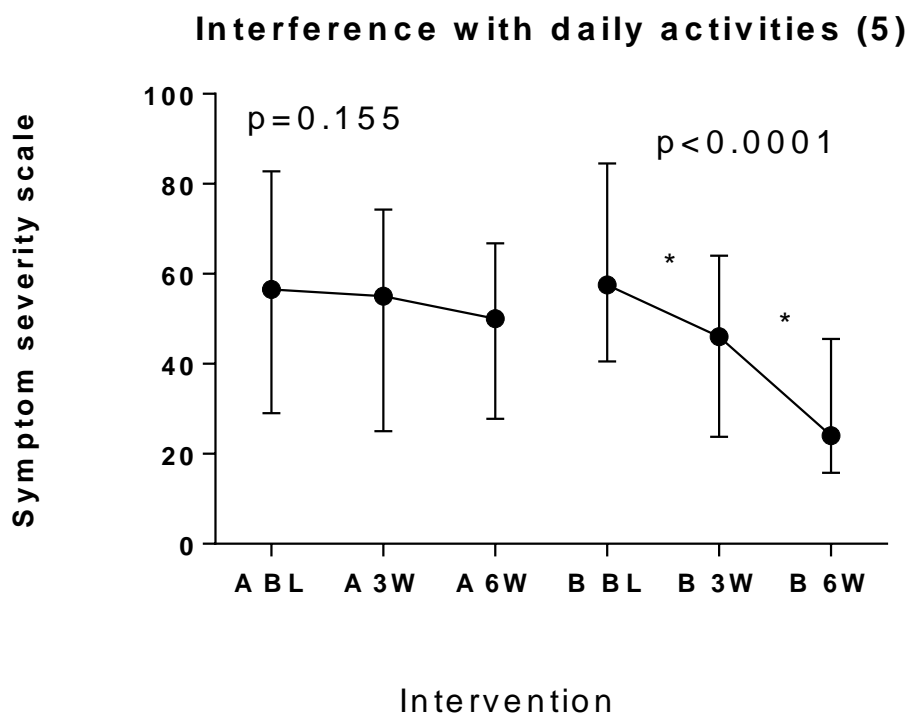


Figure 17: Median scores with IQR for interference with daily activities (question 5) at baseline, 3 weeks and 6 weeks in group A and B. Scores from 0-100.

3.5.10 “In the last seven days, have you had satisfactory relief of your IBS symptoms?”

In the beginning of the questionnaire we asked if the patients had felt satisfactory relief of their IBS symptoms the last seven days. At baseline only 5% of the patients in both group A and group B were satisfied. After 6 weeks, 45% in group A and 55% in group B were satisfied (see table 10). There were no statistical differences between the two groups at any time points.

Table 10: Number of patients having a satisfactory relief of their IBS symptoms at baseline, 3 weeks and 6 weeks, in group A and B.

	Baseline	3 weeks	6 weeks
Group A, n	1 (5%)	6 (30%)	9 (45%)
Group B, n	1 (5%)	12 (60%)	11 (55%)

3.5.11 Additional questions on general health

There were 10 additional questions on general health; nausea and/or vomiting, early satiety, headache, backache, fatigue, gas/belching, heartburn, dysuria and urgency, thigh pain and musculoskeletal pain (see table 11 and figure 18 and 19).

The reductions were greater in group B than A for all the general symptoms, except for heartburn and thigh pain. When using Dunn’s multiple comparisons test, a statistically significant reduction from baseline to three weeks or from three to six weeks was not found, but from baseline to six weeks on the questions on nausea and/or vomiting ($p=0.0013$) and gas/belching ($p=0.005$) in group B. The reduction from baseline to three weeks in fatigue was not statistically significant, but from three to six weeks and from baseline to six weeks ($p=0.0017$) it was. The lowest p-value in group A (but not statistically significant) was for headache ($p=0.0081$). There were no statistically significant reductions in the other general symptoms, but all of them except backache in group B were reduced from baseline to six weeks in both groups.

Table 11: Additional questions on general health at baseline, 3 weeks and 6 weeks for group A and B. Scores from 0 (never) to 100 (all the time) presented as median (IQR). RM-one-way ANOVA-test is used for normal distributed data and Friedman test for non-normal data, F for Friedman statistics. Multiple testing is adjusted for since there were 20 statistical tests. The significance level is therefore stricter, and the p-value has to be <0.0025 (0.05/20 tests) to be statistically significant.

		Baseline	3 weeks	6 weeks	p-value
Nausea and/or vomiting	A	11.0 (6.0-34.0)	5.5 (0.0-20.8)	2.5 (0.0-25.8)	0.0238, F=7.479
	B	17.0 (6.3-31.0)	10.5 (0.8-25.0)	4.0 (0.0-13.5)	0.0013*, F=13.290
Early satiety	A	5.0 (0.0-13.0)	2.5 (0.0-20.8)	2.5 (0.0-13.8)	0.732, F=0.623
	B	8.5 (0.5-19.5)	10.0 (0.0-22.3)	3.5 (0.0-11.5)	0.182, F=3.404
Headache	A	33.5 (14.3-71.0)	41.0 (7.3-66.8)	29.5 (7.8-54.5)	0.0081, F=9.629
	B	39.5 (11.5-56.8)	34.0 (6.3-50.8)	23.5 (5.8-31.8)	0.0077
Backache	A	39.0 (8.8-61.8)	25.0 (3.3-53.0)	25.0 (12.0-48.8)	0.474
	B	5.5 (0.5-45.9)	8.0 (0.5-43.5)	6.0 (0.0-41.5)	0.361, F=2.039
Fatigue	A	68.0 (52.0-87.3)	60.0 (39.5-83.3)	58.0 (29.3-78.0)	0.0515
	B	56.5 (48.0-87.3)	53.5 (34.0-83.8)	41.0 (22.0-74.0)	0.0017*
Gas/belching	A	70.0 (31.0-87.3)	45.0 (26.0-81.5)	40.0 (25.0-82.0)	0.0229, F=7.549
	B	63.5 (40.0-73.8)	38.5 (25.3-70.3)	27.0 (22.5-49.3)	0.0005*, F=15.150
Heartburn	A	23.5 (0.0-60.5)	3.0 (0.0-19.8)	2.0 (0.0-25.0)	0.0208, F=7.750
	B	6.5 (0.0-39.5)	3.0 (0.0-21.8)	2.0 (0.0-15.3)	0.0098, F=9.250
Dysuria and urgency	A	50.0 (4.3-73.8)	34.0 (15.5-69.3)	29.5 (7.0-62.0)	0.0421, F=6.333
	B	61.5 (13.0-74.3)	29.0 (6.8-57.5)	25.0 (3.8-50.0)	0.0031

Thigh pain	A	8.0 (0.0-47.5)	0.5 (0.0-25.0)	1.0 (0.0-28.8)	0.254, F=2.739
	B	2.5 (0.0-10.0)	2.5 (0.0-7.5)	1.0 (0.0-15.8)	0.656, F=0.844
Musculoskeletal pain	A	46.5 (4.5-78.0)	40.0 (15.5-80.0)	36.0 (25.0-75.0)	0.4093, F=1.787
	B	49.0 (15.0-86.3)	34.0 (17.5-67.8)	29.0 (9.5-71.8)	0.0560, F=5.765

Additional questions on general health, group A

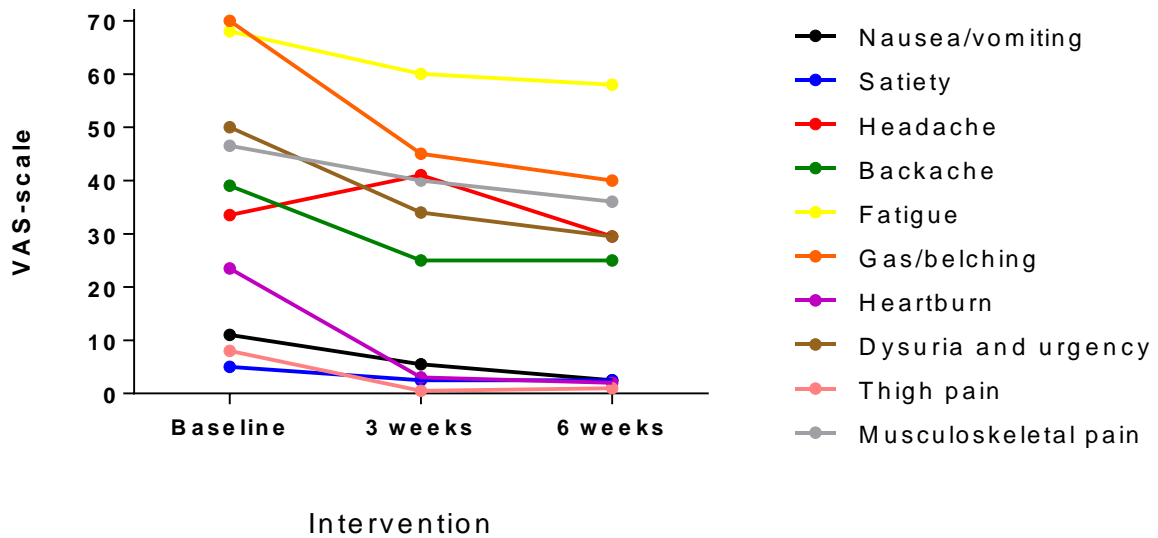


Figure 18: Additional questions on general health at baseline, 3 weeks and 6 weeks for group A. Scores from 0 (never) to 100 (all the time).

Additional questions on general health, group B

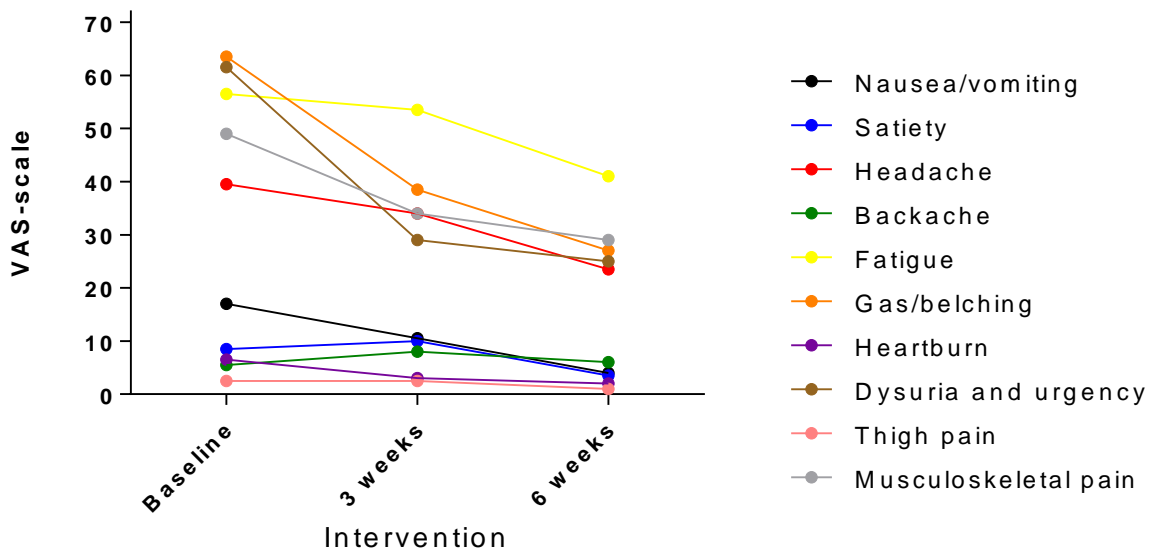


Figure 19: Additional questions on general health at baseline, 3 weeks and 6 weeks for group B. Scores from 0 (never) to 100 (all the time).

3.6 Quality of life (SF-36)

The patients filled in the SF-36 questionnaire at baseline and at the end of the diet at 6 weeks.

3.6.1 Physical component summary (PCS)

At baseline the mean score for physical health (PCS) in group A was 44.9, while it was 44.5 in group B. After six weeks, the mean score in group A was 44.5 and 48.1 in group B. There was a statistically significant increase in PCS in group B ($p=0.0061$), but not in group A. There were no statistically significant difference between the two groups neither at baseline ($p=0.886$) nor at 6 weeks ($p=0.157$) (see table 12 and figure 20).

Table 12: Physical component summary (PCS) in group A and B at baseline and at 6 weeks, given in mean \pm SD. Paired and unpaired t-tests were used for the normally distributed data.

	Baseline	6 weeks	p-value	Normal value
Group A	44.9 \pm 8.3	44.5 \pm 7.9	0.740	50 \pm 10
Group B	44.5 \pm 8.1	48.1 \pm 7.9	0.0061*	50 \pm 10

SF-36: Physical component summary

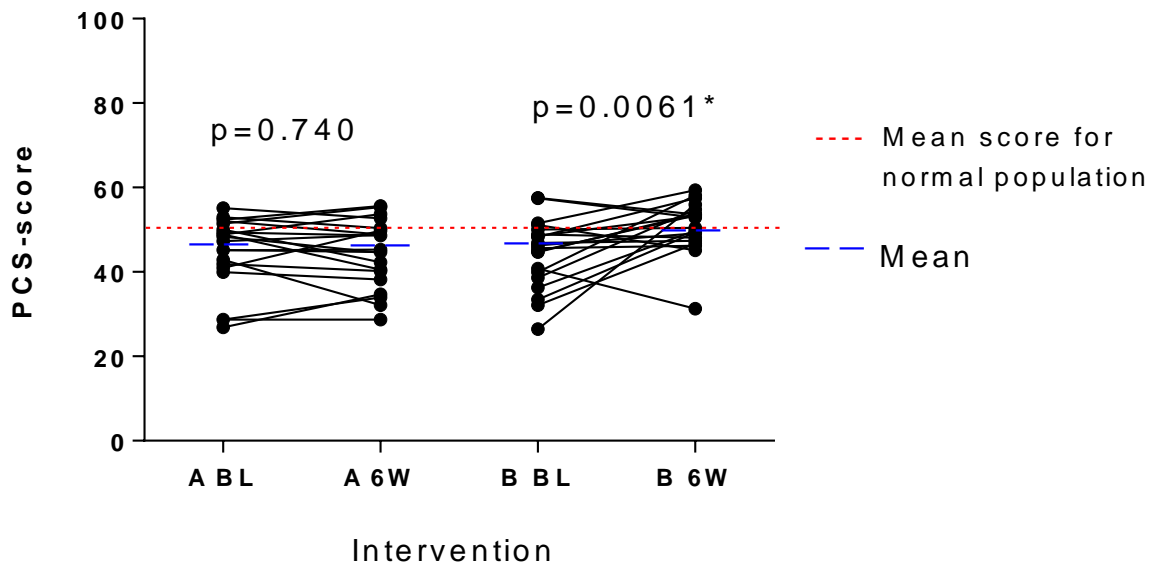


Figure 20: Physical component summary (PCS) for each patient in group A and B at baseline and at 6 weeks.

3.6.2 Mental component summary (MCS)

At baseline the mean score for mental health in group A was 47.3, while it was 46.9 in group B. After six weeks, the mean score in group A was 47.4 and 48.3 in group B. There was an increase in MCS in both groups, but it is not statistically significant in neither of them ($p=0.949$ for group A, $p=0.245$ for group B). There was no statistically significant difference between the groups at baseline ($p=0.850$) nor at 6 weeks ($p=0.772$) (see table 13 and figure 21).

Table 13: Mental component summary (MCS) in group A and B at baseline and at 6 weeks, given in mean \pm SD. Paired and unpaired t-tests were used for the normally distributed data.

	Baseline	6 weeks	p-value	Normal value
Group A	47.3 \pm 7.5	47.4 \pm 8.7	0.949	50 \pm 10
Group B	46.9 \pm 8.0	48.3 \pm 9.2	0.245	50 \pm 10

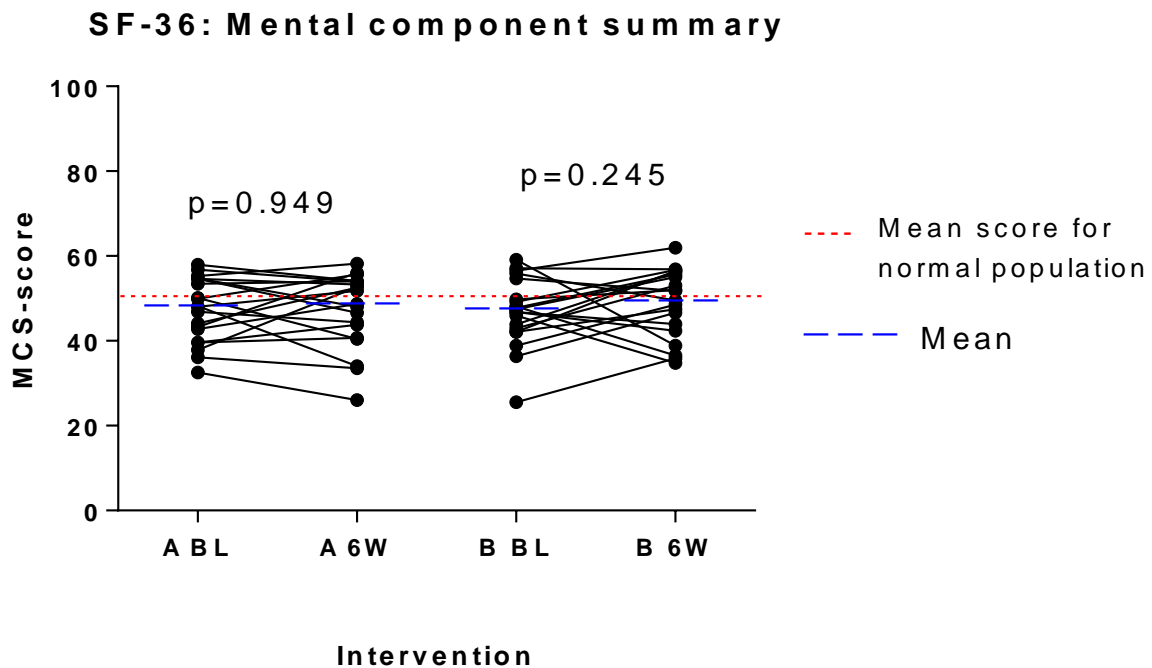


Figure 21: Mental component summary (MCS) for each patient in group A and B at baseline and at 6 weeks.

3.6.3 The eight dimensions

There were no statistically significant changes in the eight dimensions in group A, but all except for role emotional increased numerically. In group B the scores increased from baseline to six weeks in seven of the dimensions and were constant in the eight⁷. Three dimensions were statistically significant improved in group B (physical role, $p=0.036$, bodily pain, $p= 0.0039$ and general health, $p=0.0033$).

When removing outliers in group B (2 for PF, 1 for RP and 1 for RE), there was a statistically significant change in PF from baseline to six weeks ($p=0.0170$), but no differences in RP or RE. Nevertheless, all the outliers should be included since the patient group is heterogenic. There were no statistically significant differences in the eight dimensions between the two groups at baseline or at 6 weeks (see table 14 and figure 22).

Table 14: The eight dimensions in group A and B at baseline and at 6 weeks. The normed based scores are given in median (IQR). Paired and unpaired t-tests were used for normally distributed data, and Wilcoxon and Mann-Whitney tests for non-normal data. Multiple testing is not adjusted for.

		Baseline	6 weeks	p-value
PF (physical function)	A	51.8 (47.1-53.7)	52.5 (45.4-53.7)	0.134
	B	50.3 (46.9-53.5)	52.7 (48.2-53.9)	0.287
RP (physical role)	A	49.1 (44.9-53.3)	49.2 (46.5-51.8)	0.532
	B	48.8 (42.6-54.2)	51.2 (49.0-54.6)	0.036*
BP (bodily pain)	A	43.5 (37.1-47.8)	43.7 (36.2-49.2)	0.696
	B	41.6 (39.2-45.2)	48.9 (40.8-55.7)	0.0039*
GH (general health)	A	37.9 (32.9-50.2)	40.1 (31.6-48.9)	0.700
	B	39.6 (31.6-49.3)	44.2 (35.0-51.6)	0.0033*
VT (vitality)	A	40.2 (36.1-48.8)	40.5 (30.4-48.8)	0.826
	B	39.5 (33.2-50.9)	44.5 (30.8-55.2)	0.112
SF (social function)	A	44.2 (38.1-55.7)	44.3 (43.3-55.8)	0.479
	B	44.1 (37.8-54.4)	44.1 (32.2-56.0)	0.168
RE (emotional role)	A	53.8 (46.1-54.4)	53.1 (46.3-54.1)	0.475
	B	47.6 (43.7-54.1)	51.6 (46.2-54.1)	0.288
MH (mental health)	A	45.8 (40.1-54.6)	46.6 (38.7-54.6)	0.825
	B	47.9 (41.3-53.1)	51.2 (42.5-54.9)	0.196

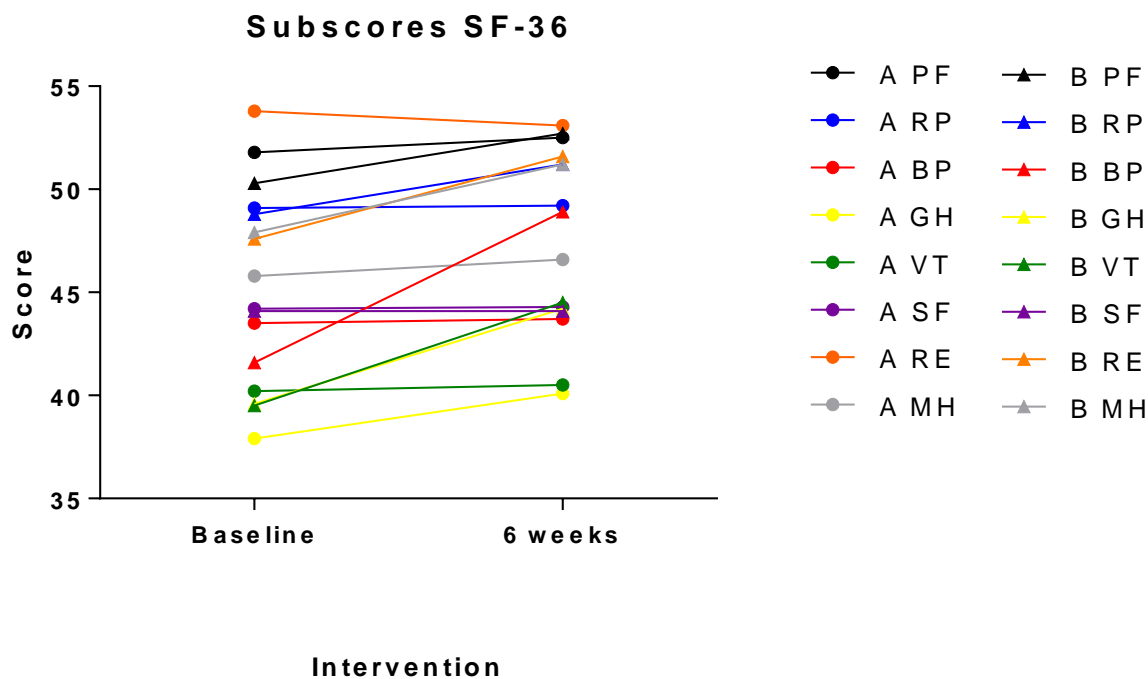


Figure 22: The eight dimensions in group A and B at baseline and at 6 weeks.

3.7 Self-reported compliance at 6 weeks (group A and B)

In group A the mean for the question about dissatisfaction with the diet and pain relief was 66.7, while it was 41.3 in group B. In this question 0 was very satisfied and 100 very displeased. There was a statistically significant difference between the two groups ($p=0.0132$). There was no statistically significant difference in how strict the two groups had followed the diet (accuracy, $p=0.972$). Here 0 was not following the diet at all and 100 only following the diet, and the mean were 93.3 for both groups. It was also a statistically significant difference in feasibility ($p=0.0008$) where 0 was “very easy” and 100 “very hard”. The mean in group A was 27.9, while it was 64.3 in group B (see table 15 and figure 23).

Table 15: Self-reported compliance at six weeks in group A and B given in mean \pm SD. The three questions with a VAS-scale from 0 to 100 is presented. Unpaired t-test for normally distributed data.

	Group A	Group B	p-value
How satisfied are you with the diet as symptom relief?	66.7 \pm 31.1	41.3 \pm 30.8	0.0132*
How closely have you followed the diet?	93.3 \pm 9.2	93.3 \pm 8.3	0.972
How do you think it was to follow the diet?	27.9 \pm 32.8	64.3 \pm 30.1	0.0008*

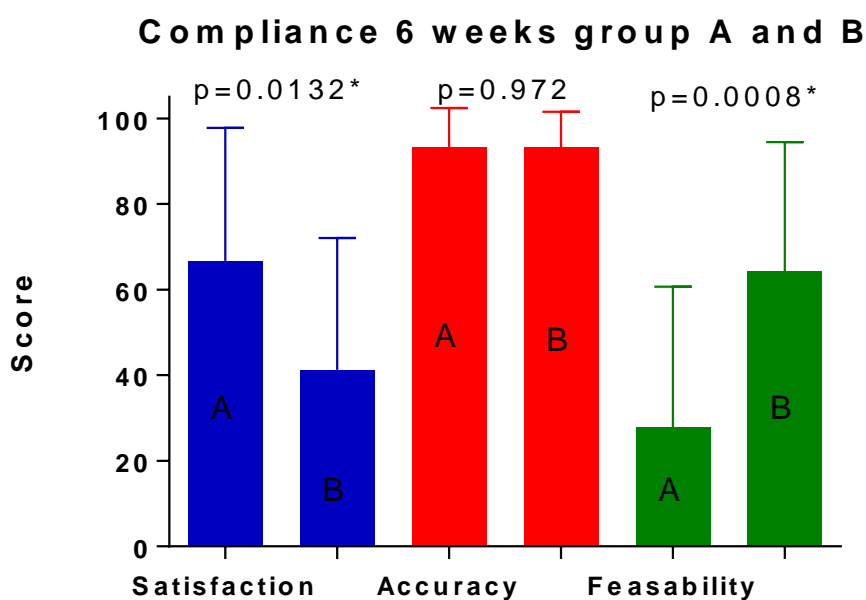


Figure 23: Self-reported compliance at six weeks in group A and B. The three questions with a VAS-scale from 0 to 100 are presented.

There were 50% in both group A and group B who reported that they wanted to continue to follow the diet after the intervention-period. Six patients in group A and two in group B reported that a lack of improvement in symptoms was the reason for not wanting to continue to follow the diet, while 1 in group A and 2 in group B reported “missed other foods” as the reason. 1 in group A said it was too time-consuming. When asking if they had any deviations from the diet, 40% in group A and 35% in group B reported none at all, 50% in group A and 55% in group B said 1-5 times in the period of 6 weeks and 10% in each group reported 1-3 times per week. The main reasons for the deviations in both groups “did not know that the food was -containing wheat starch/traces of gluten (group A)/-high in FODMAPs (group B)”. Food rich in lactose were the reason for deviation in 69% of the cases in group B.

3.8 Self-reported compliance at 10 weeks (group B)

Nine patients (45%) in group B reported that they had continued following the low FODMAP diet the last four weeks, while seven (35%) said they did it a little/sometimes and four (20%) had quit. The mean for how well they had maintained the diet the last four weeks was 61.9 (± 36.5), on a VAS-scale from 0 to 100 where 100 is “only eating low FODMAP”. The two main reasons for not continuing/only continuing a little were not feeling enough effect (5 patients) or only getting symptoms from a few types of food (3 patients).

Sixteen (80%) had tried to reintroduce all or some of the foods which had been excluded during the test period for six weeks. The mean for how hard they thought it was to reintroduce food was 42.6 (± 32.5), on a VAS-scale from 0-100 where 0 is very easy and 100 is very hard. Thirteen reported that it was hard to know if they got symptoms from exactly the food they were reintroducing, and 7 said it was hard to distinguish between “normal symptoms” and these symptoms. No one was in doubt about how to do the reintroduction. There was a trend to start with introducing food with fructans or fructose first.

4 patients said they wanted to continue to follow the diet 100%, twelve partially, one maybe and three did not want to. In the end we asked which group of FODMAPs they believe that they do not tolerate. None answered “none”, while fructans and lactose were clearly the most frequent answers.

3.9 Blood tests

Everyone had normal calcium levels at baseline in group A and at six weeks in group B. At six weeks in group A and at baseline in group B there were two patients having too low values. The mean calcium levels were normal for both groups at both time points though. There was a statistically significant increase from baseline to 6 weeks for group B ($p=0.0476$), but not for group A. There were no statistically significant differences between the two groups at baseline ($p=0.851$) nor at six weeks ($p=0.159$) (see table 16).

Everyone had normal vitamin D₃ levels in group B at baseline, while 1 patient had a high level and two low levels in group A. At six weeks, three patients in group A had lowered levels, and 2 patients in group B had high levels. The mean vitamin D₃ levels were normal for both groups at both time points. There was a statistically significant decrease from baseline to 6 weeks for group A ($p=0.0037$), but not for group B. There was not a statistically significant difference between the two groups at baseline ($p=0.206$), but at six weeks ($p=0.011$) (see table 16).

Table 16: Calcium- and vitamin D₃ blood levels at baseline and 6 weeks in group A and B, given in mean ± SD. Paired and unpaired t-tests were used for the normally distributed data.

		Baseline	6 weeks	p-value	Reference value
Calcium (mmol/L)	A	2.39 ± 0.09	2.39 ± 0.10	0.741	2.20-2.55 mmol/L
	B	2.39 ± 0.07	2.41 ± 0.07	0.0476*	
Vitamin D₃ (nmol/L)	A	73.6 ± 18.7	63.9 ± 18.5	0.0037*	50.0-113.0 nmol/L
	B	81.6 ± 19.9	81.5 ± 22.1	0.961	

At baseline and at six weeks 5 patients in group A (max. 44.5 and 39.3) and 1 patient in group B (121.5 and 110.9) had raised anti-transglutaminase 2 IgA-levels. There were 2 patients from group A (max. 35.8 and 250.0) and 3 patients (max.35.5 and 250.0) from group B who had raised anti-deamidated gliadin IgG-levels at baseline and after 6 weeks. The median levels were normal and there was a statistically significant decrease in both tests from baseline to six weeks, in both groups. Regarding anti-transglutaminase 2 IgA there were statistically significant differences between the two groups both at baseline (p=0.0315) and at six weeks (p=0.0405), but this was not the case regarding anti-deamidated gliadin IgG (p=0.356 and p=0.281) (see table 17).

Table 17: Anti-transglutaminase 2 IgA- and anti-deamidated gliadin IgG blood levels at baseline and 6 weeks in group A and B. The levels are given in median (IQR). Wilcoxon tests are used because of non-normal data, and Mann-Whitney-tests are used between the groups.

		Baseline	6 weeks	p-value	Reference value
Anti-transglutaminase 2 IgA	A	5.2 (1.0-15.3)	5.1 (0.5-16.0)	0.0175*	<14.9
	B	1.7 (0.5-2.9)	1.4 (0.5-3.3)	0.0072*	
Anti-deamidated gliadin IgG	A	4.8 (0.6-8.0)	4.3 (0.7-6.0)	0.0012*	<14.9
	B	0.9 (0.4-8.7)	0.7 (0.4-6.8)	0.0039*	

3.10 Breath test and stool samples

Results from these analyses are not presented here, because it is done in another Master's Thesis.

3.11 Correlation analyses

Correlation analyses were performed, but no statistically significant correlations were found in neither of the groups between the changes in for instance FODMAP intake and; IBS-SSS total score, the five main IBS-SSS questions or PCS (data not shown). A statistically significant positive correlation was found in group B between the change in FODMAP intake and MCS ($r=0.473$, $p=0.0351$), which means that approximately 22% (r^2) of the change in MCS (increasing) in group B can be explained by the change in FODMAP intake (decreasing). A statistically significant positive correlation was also found in group B between the change in total IBS-SSS and the change in MCS ($r=0.555$, $p=0.011$). Approximately 31% (r^2) of the change in MCS-score (increasing) in group B can be explained by the change in total IBS-SSS (decreasing).

There were no statistically significant correlations between how satisfied the patients were with the diet and pain relief, and if they had continued to follow the diet after the intervention, in group A nor B, or between how hard they thought it was to follow the diet, and the same with the reintroduction of FODMAPs.

4. DISCUSSION

4.1 Main findings

In this randomized controlled clinical trial the effect of a low FODMAP diet was studied as an addition to a gluten free diet in coeliac patients with IBS-like symptoms, especially regarding abdominal symptoms and quality of life. The patients in group B reduced their FODMAP intake from 7.7 g/day to 1.3 g/day. Their baseline FODMAP intake is already low which means that these patients have a reduced intake already at start. This is probably because of their exclusion of wheat, rye and barley from their diets which are food rich in FODMAPs. 1.3 g/day is a low intake and shows good compliance to the diet. The reduction was associated with a statistically significant improvement in abdominal pain severity, abdominal pain frequency, abdominal bloating severity, dissatisfaction with bowel habits and interference with daily activities. Other symptoms like nausea/vomiting, gas/belching and fatigue was also statistically significant improved in group B. An improvement in subjective report of physical health after following a low FODMAP diet for six weeks was also found. An improved quality of life was the superior goal and having a good quality of life is maybe even more important than reducing the amount of symptoms. It is reasonable to think that less abdominal pain and bloating will lead to a better quality of life. In this study, the physical health improved statistically significantly in group B already after six weeks. When looking at the dimensions; physical role, bodily pain and general health were statistically significant improved. The reason for this might be that the patients' abdominal symptoms are less prominent in their everyday life, which the statistically significant reduction in question 5 in IBS-SSS (Interference with daily activities) indicates. Approximately 31% of the improvement in mental health in group B may be explained by the reduction in abdominal symptoms. The improvement would maybe be greater if the intervention lasted for a longer time.

80% in group B reported that they had continued to follow the low FODMAP diet four weeks after the intervention ended, which indicates an ongoing effect. As far as we know, there is no published research on low FODMAP diet to patients with coeliac disease. The results in this study show for the first time that this treatment may help to relieve abdominal symptoms and improve physical health in many patients, and that such dietary change is an important part of the treatment for this patient group. Although a gluten free diet is basically most important, instruction about reduction in FODMAP content in the diet should be offered to coeliac patients

with IBS-like symptoms.

In addition to the intervention group, a control group only getting placebo instead of following a low FODMAP diet was considered, but the classical solution of further gluten reduction was found to be a better comparison. The traditional approach and today's treatment practice when still having abdominal symptoms on a strict gluten free diet, is to follow an even more strict gluten free diet without wheat starch and "traces of gluten". Our aim was to compare this regime to the low FODMAP diet. In this way the patients in group A also had to make changes in their diets, intended to reduce their abdominal symptoms and improve their quality of life. This makes the treatment group and the control group comparable. Indeed we did find a statistically significant reduction in abdominal pain severity and an overall reduction of IBS symptoms in group A, but not in the other main abdominal symptoms and improvement of quality of life seen in group B. In our view this shows that the low FODMAP diet is superior to the traditional treatment approach for these patients.

The mechanism behind the IBS-like symptoms in otherwise well-treated coeliac patients is not known. The inflammation of the mucosa seen in coeliac disease is thought to predispose for IBS. Differential diagnosis like coeliac disease has to be excluded before diagnosing IBS since it is a diagnosis of exclusion. Some of the patients in this study may have sought health care because of their IBS-like symptoms and then coeliac disease has been detected. Patients with for example IBD like Crohn's disease and ulcerative colitis can also have residual symptoms compatible with IBS (IBD-IBS), the inflammation again predisposing. Some of the patients in our study may have a temporary secondary lactose intolerance which can be tested for with a breath test.

4.2 The design

Randomized controlled trials are the gold standard in research on medical interventions and very strong evidence for causality. When using this design confounding factors can be largely eliminated and there is no information bias on exposure or selection bias at baseline because the groups are made up by randomization. The two groups in our study were comparable for prognostic factors. The patients could have got better anyway as a natural course of their disease, and therefore another group was added to know if they got better because of the intervention or not. Group A in some way act as a control group, but the patients in this group

did not get placebo, but an actual intervention and can be compared to group B. Our study was not blinded and that is an obvious weakness. It would of course be better if the patients did not know which group they were in regarding the placebo effect, but it is hard to do this in practice.

4.3 Patient response and recruitment

It was hard to recruit enough patients for this project. The objective was to include 40 patients in total, 20 patients in group A and 20 in group B. This goal was reached and considered a reasonable number of patients based on previous research. As mentioned, around 1000 people in Hordaland may have coeliac disease and IBS-like symptoms. It would maybe be better to include more patients, but since the intervention in group B was so effective it would maybe be a little bit unethical to let more patients follow the diet in group A. In addition, the number of patients was found a suitable amount of work for a Master Project. Calculation of strength was not performed since this was a smaller project, and the intervention in group B was very effective. We made no log with the number of patients considered and contacted, but information about the study has probably reached a high number of people.

Some patients were not included in the study for different reasons. Travel distance, time pressure, pregnancy, a wish to only attend one of the groups, lack of a verified coeliac disease diagnosis and bad appetite are some examples. In addition, some did not show up and some sent us emails without an explanation. The Rome III criteria-questionnaire is a simple tool used for including or excluding participants in our study. It does not have many questions, so it should not be demanding. Some patients found some of the questions hard to understand. The patients could possibly exaggerate their abdominal symptoms in order to be included in the study and then get more counselling. Only one did not fulfil the Rome III and/or IBS-SSS questionnaires, which mean that the coeliac disease patients had IBS-like symptoms and were the wanted patient group. Three dropped out of the study because they said FODMAP reduction was too demanding in their busy life.

There are some potential sources of error regarding the recruitment. Some suitable patients could have been missed and excluded when reading medical records because of comorbidities and medications, not all the participants had attended a course at LMS, maybe the information they got were not good enough, not everyone is on Facebook, people are maybe seldom at NCF's webpage etc. It is imaginable that the younger patients are more active on the Internet and on

Facebook. Newly diagnosed patients or the patients with the most severe symptoms are maybe more active in the advocacy group, and more likely to see our announcements. Nevertheless, bias in the recruitment is not very likely since we have probably reached a wide range of people by using many different recruitment methods.

The upper age limit was set to 60 years as a starting point. This was because the patients should be employed, not have that much comorbidity, have a good memory, being able to follow a strict diet etc. The lower age limit was set to 18 years to exclude children who can have another response to the diets and they are maybe not capable of following these diets. Nevertheless, two patients older than 60 years were included in the project. That was because they contacted us several times and really wanted to be a part of the project. Afterwards, they should maybe not been included based on their personalities, bad memory and lacking ability to follow a strict diet.

4.4 Implementation

Altogether, the implementation of the project went very well. The patients were instructed both in groups and one by one. Maybe it would be better to instruct them all one and one to have the possibility to individualize more, like for example going through their dietary intake records together. On the other hand, this is maybe of smaller importance since we found such a great effect in reducing the FODMAP intake, symptoms and improving quality of life. The threshold for asking questions would maybe be lower if the meetings were individual. On the other hand, the patients were told to contact us anytime – both by phone, SMS and e-mail if they wanted to, and FODMAP reduction was adequate in all the patients in group B.

4.5 The two diets

The only treatment for coeliac disease today is a life-long exclusion of gluten from the diet, regardless of the severity of symptoms. These patients are therefore already used to follow a strict diet, and will maybe easier manage to follow an even stricter diet like the two used in this study, than for example an IBS group. If a patient still has abdominal symptoms, the classical solution is to try to find sources of gluten in his/her diet and to avoid them. Thereafter wheat starch and “traces of gluten” can be excluded, which was the intervention in group A. It is reasonable to try this diet before the low FODMAP diet as the compliance questionnaires interpret that it seems to be less demanding to follow. There was a statistically significant improvement in some abdominal symptoms in both groups, and the antibodies were lowered

after six weeks which interpret a lower intake of gluten.

The low FODMAP diet is well documented as a treatment for IBS, and in this study it also gave a reduction in abdominal symptoms and improved physical quality of life in patients having coeliac disease and IBS-like symptoms. There are apparently some limitations with the low FODMAP diet. In the first phase the diet can be less varied and therefore less nutrient-rich. Especially the fibre intake can be reduced in addition to calcium, but there were no statistically significant reductions in this study even though the intake of dietary fibre decreased in both groups. Dietary fibre is found in bread, cereals, fruits and vegetables and even though it is not the intention to reduce the intake of these kinds of foods, the choices are fewer on the strict diets, and this may be the reason for the reduced intake. If the fibre intake is low on this diet, it is important to find good replacements or take a supplement. For constipated patients which there were most of in our study, Visiblin could be used.

The diet can also be really demanding for the participants and it requires a lot of time, desire and energy to go through it. The labelling of food does not show what kind of food which is high in FODMAP and which is low, so the patients have to read a lot of information. It is important though, to remember that the exclusion period is not forever, only for six weeks. It can be expensive and social gatherings can be a challenge. Some will feel that they are nagging, and think it is unpleasant to avoid basal food. A good advice is to ask for the menu in advance. It can also be challenging when making food for the whole family, and when travelling to other countries. The clue is to see possibilities instead of limitations.

In this study, it seemed to be important to follow the most restrictive FODMAP reduction for 6 weeks and not 3 weeks. It may be individual if 4 or 8 weeks is the ideal time period to follow the strict diet. It takes some time to get the routines and it can be demanding and a change in the everyday life. It is important to encourage the patients to continue even if they are struggling after a few weeks, because it might be easier to follow the diet after a while and the symptoms will also often continue to decrease. In this study there were greater reductions in abdominal symptoms from baseline to three weeks than from three to six weeks in group B, but still they continued to decrease from three to six weeks. There is not a threshold limit regarding FODMAP intake; it has an accumulating effect. A “bucket” is often used as a picture for the capacity.

There is a need for research on possible long-term effects of the diet. How will it affect the gut microbiota for example? Food like legumes and onion has a high content of FODMAPs and prebiotics which can have a positive effect on the gut. What will a reduction in prebiotics lead to? Because of this it is maybe not advisable to follow this diet for more than six weeks, and it is important to do the reintroduction.

4.6 Demography

There were no statistically significant differences in baseline characteristics between the two groups, and this is a strength which means that the randomization was successful. It also means that the two groups are comparable and gives a better picture of the effects of the different treatments.

We included four patients out of Hordaland, the rest from Hordaland. Clearly more women than men were included in this project which agrees with the fact that more women than men have IBS. There are also more women than men having coeliac disease, although the imbalance in sex distribution is minor here than for IBS. Some possible explanations could be that more women tend to seek health care, women are maybe more willing to make a change in their lives and are often responsible for the cooking. This imbalance in sex can be a source of error, because the diets may have different effects in men and women.

IBS is more common in people younger than 45 years, while coeliac disease is more common in people between 50 and 69 years old. In our study 23 patients were younger than 45 years, while 7 were between 50 and 69 years old. The mean age was 39 years old in group A and 43 years old in group B.

The median BMI was in the normal range at baseline when comparing with a healthy population. BMI in IBS patients may be different though (131). Most patients had constipation, and it is possible that the diets have different effects on patients with constipation and diarrhoea. If the study should be done all over again, the patients should be weighed at baseline and after six weeks to see if there was a difference. Data on when the different patients got the coeliac disease diagnosis, how long they have had it and for how long they had been eating a gluten free diet should be looked up.

4.7 Dietary intake record and FODMAP intake

This method is the gold standard for measuring a person's food intake. Some advantages with the method are that trends in meal pattern can be spotted and representative details can be collected by including week- and weekend-days. A study found that the accuracy in the recording decreased if the patient had to record for more than four days (132). The fact that foods and beverages are weighed is a huge advantage, because the calculations of nutrients are getting more precise.

There are as always some possible sources of error. First of all, underreporting of food intake is common, especially with women. BMR-factor was therefore calculated at baseline for every patient to evaluate the degree of underreporting of energy intake. Over reporting is another potential problem. A change in behaviour and in what food you are eating can happen, because it is easier to report or to avoid some types of foods. Sometimes, patients report things they have or have not been eating, trying to impress the researcher or to avoid criticism (1). It is also natural that the intake (and therefore also nutrients) will vary from day to day and also with the time of the year.

Bad memory can be a problem if the patient is filling it in a long time after eating the food. It is therefore preferred that the patients record their intake continuously (4, 133), and the patient has to be motivated. Eating at restaurants or at friends is another potential problem, because then the patients do not know the exact contents in what they are eating. In addition, people have different interpretations of portion sizes and weighed records are therefore more precise. Some filled in the record very precise, while others did not write portion sizes. Plotting and calculations in Kostholdsplanleggeren can also be done wrong by the researchers. The nutrition values in the database can come from one single analysis or the mean of more analyses, calculations or other countries' databases. Kostholdsplanleggeren did not have information on all the food-items the patients had been eating.

Finding the amount of FODMAPs in different foods was quite challenging since there is no database on this as far as we know. There were analyses from Australia, Denmark and Norway, so these were compared. Sometimes the data were similar, but some data were quite different. Different methods were used for the analyses and these could be inaccurate. The amount of FODMAPs in food is likely different in Australia and Norway because of climate, soil, growth

conditions etc. There are also some foods which are not analysed. Products are not labelled with FODMAP amount, and when different manufacturers were contacted, they did not know the amount. Recipes were asked for, but these were secret. The calculations on FODMAP amount are therefore unprecise. On the other hand, FODMAP content is also unprecise in other studies. The total FODMAP intake, lactose and non-lactose FODMAPs were studied. It would of course be even better to look at all the other FODMAP groups separately in addition, but that would be too demanding because of lacking data, and estimations would therefore be unprecise. All the data were entered into Excel first, then the Fabricant table and Dietist Net. The composite products were especially demanding. All the manual calculation could also be a source of error.

The total FODMAP intake was statistically significant reduced in group B. Coeliac disease patients already have a lower amount of FODMAP in their diet since they do not eat wheat, barley and rye which are grains rich in FODMAPs. The findings in this study are therefore even more uplifting. They show that a further reduction in FODMAP intake is of great importance and reduces abdominal symptoms and improves physical quality of life. At baseline the patients in group B ate 7.7 g/day, and in comparison 23.7 g/day is the mean intake in a typical Australian diet (86) while 8.0 (6.0-19.0) g/day was the median (IQR) intake in a group of IBS patients (134). After six weeks the patients in our study reduced their FODMAP intake to 1.3 g/day, in comparison with 3.8 g/day in a Swedish study (104) and 3.1 g/day in the Australian study (86).

Lactose was looked at because Norwegian data was available and the lactose amount could therefore be separated from the total FODMAP intake. The majority of people in Norway are lactose tolerant (135), have a relatively high level of lactase and are not having a primary lactose intolerance. It is maybe likely that the other FODMAP groups are causing the IBS symptoms. Some lactose could therefore maybe be included in the low FODMAP diet here in Norway? On the other hand, some of these patients possibly have a temporary secondary lactose intolerance which is normal to have if they are newly diagnosed. A breath test can tell if a patient has lactose intolerance. The patients in our study though, should have been diagnosed for at least six months ago, and lactose should normally be tolerated after eating a strict gluten free diet for six weeks. Lactose was the dominating FODMAP group, since it is normal to ingest a lot of milk and dairy products in Norway. Another study did also find that lactose was the dominating FODMAP group (104). It is not known if it was especially lactose or some of the other FODMAP groups which led to the reduction of abdominal symptoms. It would be interesting to perform a study

where all the FODMAP groups except for lactose were reduced, to see if there is still a great effect. There is not a threshold limit regarding FODMAP intake; it has an accumulating effect. A “bucket” is often used as a picture for the capacity.

It is imaginable that some patients in group A started on a low FODMAP diet (in addition to the more strict gluten free diet) even though it was not the intention. The median total FODMAP intake actually reduced from 14.5 g/day to 12.1 g/day even though it is not a statistically significant reduction. Reasons for doing so could be a misunderstanding or a desire to try the diet. If this was the case, the results in our study would be even clearer. Also the other way around; maybe some patients in group B started on a more strict gluten free diet in addition to their low FODMAP diet. It is even not sure that the patients actually followed their diets even though they said so.

There was a trend (statistically significant in group B) of reducing the energy intake when eating one of these diets. A similar trend was found in other studies on IBS patients eating a low FODMAP diet (86, 104). Some has maybe done it on purpose, but it can indicate that it is harder to find suitable food when following such a strict diet. The mean BMR-factor is over the cut-off limit for both groups in total, but 9 (45%) from each group has a factor under the limit which may suggest underreporting of food intake. A study in Sweden found that the coeliac patients had the same energy intake as the control group after eating a gluten free diet for 10 years (136).

When comparing the patients' macronutrient intakes (carbohydrates, fats and proteins) with the Norwegian recommendations, they were fulfilled (in E%/day) both at baseline and after six weeks in both groups. This is a great finding meaning that the strict diets do not affect the recommended intake of important macronutrients. It is also representative for the mean intake in the Norwegian population in 2014 which was 47 E% from carbohydrates, 37% from fats and 15% from proteins (137). The calcium intake declined in group A and was below the recommendation (800 mg/day) at six weeks, even though there is nothing with the intervention that should require this and it could be a coincidence. It also reduced non-significantly in group B, and a lower intake of milk and dairy products can be a possible explanation. Some of the patients took calcium-supplements. None of the groups met the recommended intake of dietary fibre, neither at baseline nor after six weeks, and it declined from baseline to 6 weeks. In comparison, the general population in Norway meets the recommendations by eating 26.0 g/day

(137), but a study in Sweden found that the intake was lower in a group of coeliac patients compared with a control group (136). Other studies on IBS patients on a low FODMAP diet have also found a decreasing intake of dietary fibre (86, 104). Bread, cereals, fruits and vegetables are rich in dietary fibre and foods that the patients maybe have been eating less of on the diets.

4.8 Symptoms (IBS-SSS)

This questionnaire was used to grade the patients' IBS symptoms, and to include them in our study together with the Rome III criteria. First, the lines (VAS-scales) were measured to check if they actually were 100 millimetres. The majority of patients did not find the questionnaire demanding. Some filled it out carefully, while others hurried through it, and this may have caused over- and underreporting. When the patients are asked about different symptoms, they will probably feel more of them since they are more focused. The answers are subjective and patients will have different opinions on what is good and bad. Quality of life may also affect how the patients feel about their abdominal symptoms. In addition, the severity of symptoms will vary from day to day. All the patients scored more than 75, and from this I interpret that the questionnaire was appropriate to use. On the other hand, the questionnaire is not a questionnaire for coeliac disease and is not specific for IBS. People with other gastrointestinal disorders like Crohns disease, ulcerative colitis, tropical sprue and colorectal cancer may also score on the questionnaire without having IBS. Patients with IBD etc. were therefore excluded. There is as far as we know no questionnaire that is better though.

90% of the patients in total had fewer symptoms after the intervention, which is a high number and indicates a high success rate. In comparison, a study on IBS patients showed symptom relief in 75% of the patients (67). Only two of the patients were taking Idoform or Visiblin which may have affected the amount of their gastrointestinal symptoms.

A reduction of 50 or more in total IBS-SSS score is considered clinically significant and as a response to the treatment (116). Quantifying the reduction in percent would maybe be a better measure, since a reduction from 300 to 250 may have a different effect than a reduction from 100 to 50 for example. The mean reductions from baseline to six weeks were more than 50 in both groups (56.1 in group A and 118.7 in group B), but it was highest in group B. This means that both the groups responded to the treatment, but the patients in group B the most and much

more than 50 which reflects a great effect of the diet. In group B they responded already at three weeks, showing a relatively quick effect of the low FODMAP diet. Other studies with IBS patients (without coeliac disease though) have also found reductions in total IBS-SSS and abdominal symptoms after following a low FODMAP diet (86, 89, 104). In our study the mean IBS-SSS in group B reduced from 263 ± 70 at baseline, to 199 ± 99 at three weeks and to 145 ± 84 after six weeks. In comparison, the mean IBS-SSS reduced from 325 ± 69 at baseline to 246 ± 127 after 4 weeks in a study on IBS patients by Bohn et. al (104). The same study did also find a reduction in all the five main symptoms, but the reductions were lower than in our study.

The severity of the patients' IBS also improved over the six weeks in both groups, but especially in group B. In an IBS population, around 40% have mild IBS, 35% moderate and 25% severe (74). At baseline, the mean total IBS-SSS score was 260 in group A and 263 in group B, which indicates moderate IBS. After the study, the mean score in group A still indicated moderate IBS, while the mean score in group B was lowered and compatible with mild IBS. In our study 20% in group A and 10% in group B had mild IBS at baseline, and 15% and 45% after six weeks. 45% and 65% had moderate IBS in group A and B respectively at baseline, and 65% and 25% after six weeks. At baseline 35% in group A and 25% in group B had severe IBS, and 10% and 5% after six weeks.

In our study, there were more patients having constipation problems than diarrhoea problems. We did though find a trend that the patients with IBS-D had a greater effect (not statistically significant) of the low FODMAP diet on abdominal symptoms, than those with IBS-C. This is a reasonable finding since a lowered intake of FODMAPs leads to less gas production, osmosis and pressure on the bowel. Other studies on IBS patients have also found a better effect of the low FODMAP diet in patients with diarrhoea than in patient with constipation (85, 104, 106).

The majority of patients were more satisfied with the relief in their IBS symptoms in the end of the study than at baseline. Still, seven patients in group A and four in group B did not want to continue to follow the diet after the intervention period, while 80 % in group B reported that they actually still followed the low FODMAP diet after 10 weeks.

A reduction in 10 or more for each of the five main questions is then considered clinically significant and a response to the treatment, but again this might be a too low reduction as

mentioned above. In group A the reduction was 10 or more in abdominal pain severity, but not in the others even though they were reduced too. The patients in group B responded to the treatment in all the five questions, which means that all these symptoms improved after eating a low FODMAP diet, while only abdominal pain severity improved when eating a stricter gluten free diet.

Other gastrointestinal symptoms like heartburn, nausea/vomiting and gas/belching also improved in both groups, the last two statistically significant for group B. This is not that surprising since abdominal pain and bloating can often cause nausea and gas for instance. Other types of pain (headache, backache, thigh pain and musculoskeletal pain) were also less frequent after following one of the diets. The only exception was backache in group B, but these patients had much less of this pain already at start. Dysuria and fatigue also improved in both groups, fatigue statistically significant in group B. It is nearby to think that less abdominal symptoms will give more energy and drive. Flatulence may give a pressure on the bladder which may give frequent urination.

There is possibly also a placebo effect with the low FODMAP diet, and it was therefore important to have another intervention group acting as a control group in addition. The fact that someone takes you seriously, cares about you, includes you in a study and gives you advice can make the patients feel relieved and cheered up which can make it easier to manage their IBS symptoms. It would have been interesting to ask the patients to fill in this questionnaire also six months after the end of the intervention period to evaluate the effect after the study. The placebo effect is usually strongest in the beginning of a study, and since an improvement in symptoms were observed also from three to six weeks, it is reasonable to say that the effect was not only placebo. Contrary, a nocebo effect could be present in group A. Maybe they wanted to end up in group B, and did not believe that a stricter gluten free diet would have any effect on their symptoms and quality of life.

4.9 Physical and mental quality of life (SF-36)

There are as many as 36 questions about physical and mental health in this questionnaire, and it can feel demanding for some patients (elderly, weak-sighted etc.) to fill them in, which maybe can cause incorrect or wrong answers. Some of the questions can also appear to be very similar. Gastrointestinal disorders often affect a person's quality of life, so it was found important to

assess it. Several studies have found that patients with IBS have a reduced quality of life compared to a control group (58, 138-142). A study found that Swedish women with coeliac disease have a lower quality of life than men with coeliac disease after having the disease for a long time (143). In our study such a difference was not found neither at baseline nor at six weeks, but there were few men in our study so it is not a standard of comparison.

The physical health improved statistically significant in group B, but not in group A, which underscores the improvement in symptoms. With less abdominal symptoms it is reasonable to think that a person will feel better physically and wants to be more active. The normal PCS is set to 50, so both groups were below this, but not that much in group B at six weeks and within the standard deviation of normals ± 10 . One study found that SF-36 was invalid for severe functional somatic syndromes like IBS, especially regarding PCS (144), so there is a need for more research to find out if SF-36 is a good tool in IBS- and coeliac patients or not.

Mental health improved numerically in both groups, but the improvements were not statistically significant. Less abdominal symptoms will probably make a person less fatigued, unenterprising and depressed. Average scores in both groups were below the normal value 50 which is the mean in the Norwegian control population (128, 129), at baseline and by the end of the diet, but not that much and within the standard deviation of normals ± 10 . There would maybe be a greater improvement if the intervention lasted for a longer time, since it can feel demanding to learn and adapt to a new diet.

When looking at the eight dimensions; physical role, bodily pain and general health were the factors that were statistically significant improved in group B. There are four questions about the physical health's influence on work and daily activities that are summed and give the score for physical role. Physical role improved to a bit higher score than the general population. Two questions about the severity of bodily pain and its influence on work and daily activities gives the score for bodily pain, which was a bit lower for group B compared to the general Norwegian population. General health is made up of five questions where the patients should answer what they think about their health, if they expected to get more ill, if they think they are sicker than others etc. General health in group B was quite lower than the general population, indicating that this patient group have a subjective feeling that they are sicker than others.

The scores for physical function and emotional role are better than the general population in both groups at both time points except for emotional role at baseline in group B. Ten questions about the physical health's influence on performance of activities like running, lifting heavy objects, walking and dressing up are summed and give the score for physical function. There are three questions about emotional problems' influence on work and daily activities that are summed and give the score for emotional role.

Social function is made up of two questions; if the health is influencing the patient's social life and to what degree. The patients in our study scored lower than the general population on this dimension, indicating that their diseases affect their social life in a bad way. Five questions about quantification of for example nervousness, depression, harmony and happiness is giving the score for mental health. The patients in group B scored better than the Norwegian control population at the end of the diet, while group A did not. As discussed earlier, group B had the greatest effect in reducing abdominal symptoms, which may be the reason for scoring higher on the mental health since physical and mental health are clearly connected. Vitality improved in both groups, but was still lower than the general population. Quantitative questions about initiative, energy and tiredness are summed up in this score. Another study found that vitality and general health were the dimensions coeliac patients scored lower on than a general population (145), which is consistent with our findings. Several studies on IBS patients have also found a reduced quality of life compared to a general population/control group by using SF-36 (58, 139-142), and one study found that the quality of life was lower in a group of patients who had both IBS and functional dyspepsia, than a group with IBS only (138).

4.10 Self-reported compliance

The compliance questionnaires are not validated. Misreporting and misunderstandings are possible problems. The forms could have been developed better by making the VAS-scales the same for all the questions (0 the worst and 100 the best for example). This would make it easier to compare the different questions. The patients could maybe fill in the form after three weeks in addition to baseline and six weeks, to see if the diet was followed strictly after three weeks or if they needed more time to get the routines.

It is not surprising that the patients in group B in general were more satisfied with the diet's effect on pain relief than group A, since group B got the greatest decrease in abdominal

symptoms and improvement in physical quality of life. Both groups reported high accuracy which is reflected in a statistically significant reduction in FODMAP intake for group B. Ideally the intake of gluten should be measured in both groups to check for compliance (especially group A), but this would have been really difficult. The low FODMAP diet was the most demanding diet to follow, most likely because there are more exclusions and changes in the diet. 16 patients (80%) in group B said they had continued with the diet 4 weeks after the intervention finished, which may express an ongoing effect in reducing symptoms and improving the quality of life.

4.11 Blood test

The blood tests were used as an explanatory variable. It was interesting to check the patients' values of different nutrients, liver tests and of course the coeliac tests. Based on these findings, efforts like more tests or supplementation could be suggested. Both patients with raised and normal coeliac tests were included. Antibodies will probably still be present for 6 months to 1 year after starting on a gluten free diet. Maybe patients with abnormal tests should be excluded or maybe the participants should be given treatment based on their coeliac tests? One idea is to give the participants with raised levels a more strict gluten free diet without wheat starch and "traces of gluten" first, before perhaps trying a low FODMAP diet, to see if this more strict gluten free diet would normalize their coeliac tests. The participants with normal coeliac tests could try the low FODMAP diet at once. Then it wouldn't be a randomized trial though.

The mean calcium- and vitamin D₃ levels were normal in both groups at both time points. The dietary intake affects the calcium level in blood to a low degree. Osteoporosis is more common in people with coeliac disease because of a malabsorption of calcium and then a reduced bone mineral density (1, 47-49). The decrease in vitamin D₃ from baseline to six weeks in the two groups is probably not because of the diets, since none of the interventions reduced or excluded good sources of vitamin D₃ like for instance fatty fish. It is more reasonable to think about the time of the year.

Regarding anti-transglutaminase 2 IgA and anti-deamidated gliadin IgG, the median of both values were statistically significant lowered after six weeks in both groups. All the values except for one in group A (anti-transglutaminase 2 IgA) were lowered after six weeks. This indicates that less gluten was ingested when following the more strict diets, but their values at the time of

diagnosis are not known. There are possible sources of error. In the pre-analytical phase there is biological variation (inwards and between persons), medication-use, stress, body position, fasting, physical activity, circadian rhythm etc. There can also be errors in the pre-instrumental phase, in the sampling, the analytical phase and the post-analytical phase like transport and storage.

4.12 Breath test, gas production, stool samples and microbiota

This is not discussed here, because it is done in another Master's Thesis.

4.13 Possible improvements to the study

With more resources and money, the study could maybe been better. If the study should be done all over again, the recruiting process should be started earlier and more patients could be included to get a better scientific power and make the study even more representative for the population. A third group continuing eating their regular gluten free diet serving as a placebo group, or a group eating their gluten free diet in addition to following the general recommendations when having an irritable bowel (but not the low FODMAP diet) could also be possibilities. Making the study double blind is really hard, but would have been even better. Provocation with FODMAP after the strict phase could also be a possibility, but it is maybe unethical to cause more symptoms in patients.

More and better information about the FODMAP content (total and the different types) in food is necessary to get more precise results, especially from Norway. It would have been interesting to study other micronutrients in addition to calcium and vitamin D₃. Making the compliance questionnaires simpler, using SF-12 instead of SF-36 maybe, a longer intervention-time (8 weeks?) and more precise dietary intake records are other efforts that could have been done. It would also be interesting to know when the patients got the coeliac disease diagnosis and for how long they had been eating a gluten free diet, to see if these factors affect the response to the diets or not. It would maybe be better to individualize the meetings. The patients reported their weight and height at baseline, but it would be better to measure their actual weight and height at the baseline meeting and also after six weeks to see if the strict diets lead to weight loss. Calculating the amount of gluten intake and all the different FODMAP groups and not only lactose, could also be done.

5. CONCLUSION

The purpose of this project was to investigate whether patients with coeliac disease and IBS-like symptoms could have a benefit on abdominal symptoms and quality of life, from FODMAP reduction in addition to their gluten free diet. The aim was also to investigate whether a low FODMAP diet would have any effect on the gut microbiota and the degree of fermentation by gut bacteria, measured with breath tests and stool samples (another Master's Thesis).

This study showed a statistically significant improvement in abdominal symptoms and subjective report of physical health in a group of patients with coeliac disease and irritable bowel syndrome-like symptoms, after following a low FODMAP diet for six weeks. The low FODMAP diet was more effective than a more strict gluten free diet without wheat starch and "traces of gluten", and should be offered to coeliac patients with IBS-like symptoms. A lowered intake of fermentable oligo-, di-, monosaccharides and polyols which leads to less production of gas, and then less water and pressure on the bowel, is probably the cause for the improvement. There is a need for more high quality research on this topic.

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7. APPENDIX

- Attachment 1: Rome III criteria for diagnosing IBS
- Attachment 2: IBS-SSS
- Attachment 3: SF-36
- Attachment 4: Compliance with gluten free diet (group A)
- Attachment 5: Compliance with low FODMAP diet, 6 weeks (group B)
- Attachment 6: Compliance with low FODMAP diet, 10 weeks (group B)
- Attachment 7: Dietary food intake record
- Attachment 8: Gluten free brochure
- Attachment 9: Additional information for group A
- Attachment 10: Low FODMAP brochure
- Attachment 11: Additional information for group B
- Attachment 12: Protocol
- Attachment 13: Information letter
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- Attachment 16: Abstract sent to the ESPEN conference in Copenhagen 2016
- Attachment 17: Abstract sent to United European Gastroenterology Week in Vienna

Attachment 1: Rome III criteria for diagnosing IBS

Roma III-kriteriene

Diagnostikk av IBS-symptomer etter Roma III

DATO:

NAVN:

ALDER:

1. *IBS-KRITERIER*

(Sett ring rundt svaret)

Spørsmål	Svar	
1.1. Har du vært plaget av smerter eller ubehag i magen i minst 3 dager per måned i løpet av de siste 3 månedene?	Ja	Nei
1.2. Har du hatt disse plagene i 6 måneder eller mer?	Ja	Nei
1.3. Er plagene forbundet med endret hyppighet av avføring?	Ja	Nei
1.4. Er plagene forbundet med endret form eller utseende av avføringen?	Ja	Nei
1.5. Reduseres plagene dersom du får tømt deg skikkelig for avføring?	Ja	Nei

2 *Tilleggsspørsmål for å karakterisere plagene*

(Sett ring rundt svaret)

Spørsmål	Svar	
2.1 Hvis du har diaré, hender det at avføringen er fast inn i mellom?	Ja	Nei
2.2 Hvis du har forstoppelse, hender det at avføringen er løs inn i mellom?	Ja	Nei
2.3 Er ufullstendig tømming av avføring et problem for deg?	Ja	Nei
2.4 Har du avføring om natta?	Ja	Nei
2.5 Hva har du mest av?	Diaré	
	Forstoppelse	
	Om lag likt	

3 *Kvantisering av IBS symptomer*

Angis på en skala fra 0 til 10, der 0 = ingen symptomer og 10 = alvorlige symptomer

(Angi med tall fra 0 til 10)

Spørsmål	Svar
3.1 Kvalme	
3.2 Oppblåsthet	
3.3 Magesmerter	
3.4 Forstoppelse	
3.5 Diaré	
3.6 Anoreksi (ulyst på mat)	

Attachment 2: IBS-SSS

IBS-SSS

1. Har hatt tilfredsstillende lindring av dine IBS-smerter/-ubehag de siste 7 dager? Sett en ring rundt svaret ditt. **JA** **NEI**
2. a) Har du magesmerter? Sett en ring rundt svaret ditt. **JA** **NEI**
- b) Dersom ja, hvor sterke er magesmertene? (marker på linja)
- 0% _____ 100%
- Ingen smerte Veldig mye smerte
- c) Oppgi antall dager du har kjent magesmerter i løpet av en 10 dagers periode. Dersom du f.eks. skriver 4 betyr det at du har smerte 4 av 10 dager. Om du har smerte hver dag, skriver du 10.
- Antall dager med smerte: _____
3. a) Har du oppblåst og/eller spent mage? Sett en ring rundt svaret ditt. **JA** **NEI**
- b) Dersom ja, hvor mye plaget er du? (marker på linja)
- 0% _____ 100%
- Ingen plager Veldig mye plager
4. Hvor fornøyd er du med dine avføringsvaner? (marker på linja)
- 0% _____ 100%
- Veldig fornøyd Veldig misfornøyd
5. Angi med en strek på linja nedenfor hvor mye dine IBS- plager påvirker livet ditt generelt.
- 0% _____ 100%
- Ingen påvirkning Stor påvirkning

Lider du av følgende:

- a) Kvalme og/eller oppkast?
0% aldri |-----| 100% hele tiden
- b) Vanskelig for å spise opp alt ved måltidet?
0% aldri |-----| 100% hele tiden
- c) Hodepine?
0% aldri |-----| 100% hele tiden
- d) Rygg smerter?
0% aldri |-----| 100% hele tiden
- e) Uopplagt eller trøtt?
0% aldri |-----| 100% hele tiden
- f) Raping og/eller gassavgang?
0% aldri |-----| 100% hele tiden
- g) Halsbrann?
0% aldri |-----| 100% hele tiden
- h) Hyppig eller plutselig trang til vannlating?
0% aldri |-----| 100% hele tiden
- i) Smerter i låret?
0% aldri |-----| 100% hele tiden
- j) Smerte i muskler og ledd?
0% aldri |-----| 100% hele tiden

Attachment 3: SF-36

SF-36 Norsk versjon

SF-36® Health Survey© 1988, 2002 by JE Ware, Jr., MOT, Health Assessment Lab,
QualityMetric Incorporated – All rights reserved
SF-36® is a registered trademark of the Medical Outcomes Trust (MOT)

Vi spør deg her om hvordan du opplever din egen helse. Vi ønsker å vite hvordan du føler deg og hvordan du mestrer dine vanlige aktiviteter.

Vær snill å svare på alle spørsmål. Noen av spørsmålene ligner på hverandre, men alle er forskjellige. Ta deg tid til å lese spørsmålene nøye og svar med et kryss for det alternativ som du velger!

Takk for at du svarer på disse spørsmålene!

Pasientnummer:

Dato:

Besøksnummer:

1. Stort sett, vil du si at din helse er:

Utmerket	Meget god	God	Nokså god	Dårlig
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. **Sammenlignet med for ett år siden**, hvordan vil du si at helsen din stort sett er nå?

Mye bedre nå enn for ett år siden	Litt bedre nå enn for ett år siden	Omtrent den samme som for ett år siden	Litt dårligere nå enn for ett år siden	Mye dårligere nå enn for ett år siden
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. De neste spørsmålene handler om gjøremål som du kanskje utfører i løpet av en vanlig dag. Er **din helse nå slik at den begrenser deg** i utførelsen av disse aktivitetene? Hvis ja, hvor mye?

	Ja, begrenser meg mye	Ja, begrenser meg litt	Nei, begrenser meg ikke i det hele tatt
Anstrengende aktiviteter , som å løpe, løfte tunge gjenstander, delta i anstrengende idrett	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Moderate aktiviteter , som å flytte et bord, støvsuge, gå en tur eller drive med hagearbeid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Løfte eller bære en handlekurv	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gå opp trappen flere etasjer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gå opp trappen en etasje	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bøye deg eller sitte på huk	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gå mer enn to kilometer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gå noen hundre meter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gå hundre meter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Vaske deg eller kle på deg	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4 I løpet av **de siste fire ukene**, har du hatt noen av følgende problemer i ditt arbeid eller i andre av dine daglige gjøremål på grunn av din fysiske helse?

	Hele tiden	Det meste av tiden	En del av tiden	Litt av tiden	Ikke i det hele tatt
Har du reduisert tiden du har brukt på arbeidet ditt eller andre aktiviteter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Har du utrettet mindre enn du hadde ønsket	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Har du vært hindret i visse typer arbeid eller andre aktiviteter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Har du hatt vansker med å utføre arbeidet ditt eller andre aktiviteter (for eksempel fordi det krevde ekstra anstrengelser)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. I løpet av **de siste fire ukene**, har du hatt følelsesmessige problemer som har ført til vanskeligheter i ditt arbeid eller i andre av dine daglige gjøremål (for eksempel fordi du har følt deg deprimert eller engstelig)

	Hele tiden	Det meste av tiden	En del av tiden	Litt av tiden	Ikke i det hele tatt
Har du redusert tiden du har brukt på arbeidet ditt eller andre aktiviteter	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Har du utrettet mindre enn du hadde ønsket	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Har du ikke arbeidet eller utført andre aktiviteter like nøye som vanlig	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

6. I løpet av de **siste 4 ukene**, i hvilken grad har din fysiske helse eller følelsesmessige problemer hatt innvirkning på din vanlige sosiale omgang med familie, venner, naboer eller foreninger?

Ikke i det hele tatt	Litt	En del	Mye	Svært mye
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

7. Hvor sterke **kroppslige** smerter har du hatt i løpet av **de siste 4 ukene**?

Ingen	Meget svake	Svake	Moderate	Sterke	Meget sterke
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

8. I løpet av **de siste 4 ukene**, hvor mye har smerter påvirket ditt vanlige arbeid (gjelder både arbeid utenfor hjemmet og husarbeid)?

Ikke i det hele tatt	Litt	En del	Mye	Svært mye
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

9. De neste spørsmålene handler om hvordan du har følt deg og hvordan du har hatt det **de siste 4 ukene**. For hvert spørsmål, vennligst velg det svaralternativet som best beskriver hvordan du har hatt det. Hvor ofte i løpet av **de siste 4 ukene** har du ...

	Hele tiden	Det meste av tiden	Endel av tiden	Litt av tiden	Ikke i det hele tatt
følt deg full av tiltakslyst?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
følt deg veldig nervøs?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
vært så langt nede at ingenting har kunnet muntre deg opp?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
følt deg rolig og harmonisk?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
hatt mye overskudd?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
følt deg nedfor og trist?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
følt deg sliten?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
følt deg glad?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
følt deg trøtt?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

10. I løpet av de **siste 4 ukene**, hvor mye av tiden har din fysiske helse eller følelsesmessige problemer påvirket din sosiale omgang (som det å besøke venner, slektninger osv.)?

Hele tiden	Nesten hele tiden	En del av tiden	Litt av tiden	Ikke i det hele tatt
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

11. Hvor **RIKTIG** eller **GALT** er hver av følgende påstander for deg?

	Helt riktig	Delvis riktig	Vet ikke	Delvis gal	Helt gal
Det virker som jeg blir litt lettere syk enn andre	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jeg er like frisk som de fleste jeg kjenner	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jeg forventer at min helse vil bli dårligere	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Min helse er utmerket	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Attachment 4: Compliance with gluten free diet (group A)

Overholdelse av strikt glutenfri kost gjennom 6 uker

Hvor fornøyd er du med strikt glutenfri kost som symptomlindring?

Svært fornøyd

Svært misfornøyd

0%  100%

Kan du tenke deg å fortsette på dietten:

- Ja
- Kanskje
- Nei
- Kun dersom jeg får videre veiledning

Hvis nei, hvorfor:

- For tidkrevende
- Savner for mange matvarer
- Ble ikke bedre
- For dyrt

Hvor nøye har du fulgt strikt glutenfri kost gjennom de 6 ukene?

Ikke fulgt den i det hele tatt

Kun spist strikt glutenfri kost

0%  100%

Hvor ofte hadde du avvik fra dietten i løpet av de 6 ukene:

- Ingen ganger
- 1-5 ganger i løpet av de 6 ukene
- 1-3 ganger i uken
- 4-6 ganger i uken

Hvor store mengder inntok du ved avvik fra dietten?

- En munnfull
- 2-5 munnfull
- Et helt måltid
- Alle måltidene i løpet av dagen

Hvor lenge gikk du på dietten før du spiste matvarer med hvetestivelse/spor av gluten?

- Ingen dager
- 1-3 dager
- 4-7 dager
- 2-3 uker
- 3-5 uker

Hvordan synes du det var å følge dietten:

Kjempelett

Veldig utfordrende

0%



100%

Hvorfor spiste du matvarer som inneholdt hvetestivelse/spor av gluten:

- Spiste kun strikt glutenfri kost
- Ikke tilgang på mat uten hvetestivelse/spor av gluten på restaurant/gatekjøkken
- For tidkrevende
- Hadde lyst på mat med hvetestivelse/spor av gluten
- Mat uten hvetestivelse/spor av gluten var for dyr
- Visste ikke at matvaren inneholdt hvetestivelse/spor av gluten

Hvor fornøyd er du med informasjonen du fikk om dietten:

- Meget fornøyd
- Fornøyd
- Ok
- Misfornøyd
- Meget misfornøyd

Attachment 5: Compliance with low FODMAP diet, 6 weeks (group B)

Overholdelse av lav-FODMAP dietten gjennom 6 uker

Hvor fornøyd er du med lav-FODMAP dietten som symptomlindring?

Svært fornøyd

Svært misfornøyd

0%



100%

Kan du tenke deg å fortsette på dietten:

- Ja
- Kanskje
- Nei
- Kun dersom jeg får videre veiledning

Hvis nei, hvorfor:

- For tidkrevende
- Savner for mange matvarer
- Ble ikke bedre
- For dyrt

Hvor nøye har du fulgt lav-FODMAP dietten gjennom de 6 ukene?

Ikke fulgt den i det hele tatt

Kun spist lav-FODMAP mat

0%



100%

Hvor ofte hadde du avvik fra dietten løpet av de 6 ukene:

- Ingen ganger
- 1-5 ganger i løpet av de 6 ukene
- 1-3 ganger i uken
- 4-6 ganger i uken

Hvor store mengder FODMAPs inntok du ved avvik fra dietten?

- En munnfull
- 2-5 munnfull
- Et helt måltid
- Alle måltidene i løpet av dagen

Hvor lenge gikk du på dietten før du spiste matvarer med FODMAPs:

- Ingen dager
- 1-3 dager
- 4-7 dager
- 2-3 uker
- 3-5 uker

Hvilke matvarer inneholdt avvik fra dietten:

- Fruktose**holdige matvarer som eple, pære, honning, juice, tørket frukt (rosiner, svsker, aprikos), asparges
- Laktose**holdige matvarer som melk/fløte/yoghurt og matvarer med laktose (vafler, boller, kaker, is etc.), melkesjokolade.
- Fruktan**holdige matvarer som inneholder hvete, rug og bygg som for eksempel brød, boller, vafler, kjeks, middagsmat med hvetemel.
- Fruktan**holdige matvarer som inneholder løk eller hvitløk, f.eks. middagsmat, krydder, ferdigretter.
- Galaktan**holdige matvarer som bønner, linser, kikerter eller pistasjnøtter.
- Polyoler** som man finner i sukkerfrie pastiller eller tyggis.
- Polyoler** som man finner i avokado, aprikos, blomkål, plomme, sopp, vannmelon.

Hvordan synes du det var å følge dietten:

Kjempelett

Veldig utfordrende

0%



100%

Hvorfor spiste du matvarer som inneholdt FODMAPs:

- Spiste kun lav-FODMAP mat
- Ikke tilgang på lav-FODMAP mat på restaurant/gatekjøkken
- For tidkrevende å lage lav-FODMAP mat
- Hadde lyst på mat med FODMAP
- Lav-FODMAP mat var for dyr
- Visste ikke at matvaren inneholdt FODMAPs

Hvor fornøyd er du med informasjonen du fikk om dietten:

- Meget fornøyd
- Fornøyd
- Ok
- Misfornøyd
- Meget misfornøyd

Attachment 6: Compliance with low FODMAP diet, 10 weeks (group B)

Overholdelse av lav-FODMAP dietten én måned etter diettsslutt

Har du fulgt dietten de siste 4 ukene?

- Ja
- Litt
- Innimellom
- Nei

Hvor godt har du opprettholdt lav-FODMAP dietten etter 1 mnd.?

Gått tilbake til mitt normale kosthold

Kun spist lav-FODMAP

0%



100%

Hva er grunnen til at du ikke spiser 100% lav-FODMAP lenger?

- Ikke aktuelt, følger fortsatt dietten for fullt
- Merket ikke noe effekt av dietten
- Merket ikke god nok effekt til å ofre mitt vanlige kosthold
- Det er kun noen matvarer jeg reagerer på
- Savnet for mange matvarer

Dersom du har fulgt dietten, har du reintrodusert noen FODMAPs?

- Ja
- Nei
- Kun noen matvarer
- Prøvd, men ble dårlig av alt

Hvordan synes du det var å reintrodusere matvarer til dietten?

Kjempelett

Meget vanskelig

0%



100%

Hva var utfordrende med reintroduksjon av matvarer:

- Visste ikke hvordan jeg skulle gjøre det
- At jeg mest sannsynlig kom til å få symptomer av den matvaren
- Vanskelig å skille «normale symptomer» med strikt diett (jeg ble ikke helt frisk med dietten) og symptomer jeg evt får når jeg innfører ulike FODMAPs igjen
- Vanskelig å vite om jeg fikk symptomer fra akkurat den matvaren
- Hadde ikke problemer med re-introduksjon
- Ville ikke reintrodusere noen matvarer

Hva var det du prøvde å reintrodusere først?

- Fruktose**holdige matvarer som eple, pære, honning, juice, tørket frukt (rosiner, svsker, aprikos), asparges
- Laktose**holdige matvarer som melk/fløte/yoghurt og matvarer med laktose (vafler, boller, kaker, is etc.), melkesjokolade.
- Fruktan**holdige matvarer som inneholder hvete, rug og bygg som for eksempel brød, boller, vafler, kjeks, middagsmat med hvetemel.
- Fruktan**holdige matvarer som inneholder løk eller hvitløk, f.eks middagsmat, krydder, ferdigretter.
- Galaktan**holdige matvarer som bønner, linser, kikerter eller pistasjnøtter.
- Polyoler** som man finner i sukkerfrie pastiller, tyggis, avokado, aprikos, blomkål, plomme, sopp og vannmelon.

Kommer du til å fortsette på lav- FODMAP dietten fremover?

- Ja, 100%
- Delvis
- Nei
- Kanskje

Hvilken type FODMAP tror du at du ikke tåler? Flere kan krysses av.

- Tåler alle
- Tåler ingen
- Fruktose**holdige matvarer som eple, pære, honning, juice, tørket frukt (rosiner, svsker, aprikos), asparges
- Laktose**holdige matvarer som melk/fløte/yoghurt og matvarer med laktose (vafler, boller, kaker, is etc.), melkesjokolade.
- Fruktan**holdige matvarer som inneholder hvete, rug og bygg som for eksempel brød, boller, vafler, kjeks, middagsmat med hvetemel.
- Fruktan**holdige matvarer som inneholder løk eller hvitløk, f.eks middagsmat, krydder, ferdigretter.
- Galaktan**holdige matvarer som bønner, linser, kikerter eller pistasjnøtter.
- Polyoler** som man finner i sukkerfrie pastiller, tyggis, avokado, aprikos, blomkål, plomme, sopp og vannmelon.

Attachment 7: Dietary food intake record



KOSTREGISTRERING

NAVN _____

ADRESSE _____

FØDSELSNR _____

HØYDE _____

VEKT _____

KLINISK ERNÆRINGSFYSIOLOG _____

Skjemaet returneres i utfylt stand til:

Helse Bergen HF

Avdeling for klinisk ernæring

Haukeland Universitetssjukehus

Pb 1400

5021 Bergen

Tlf. 55 97 38 32

INNEN: _____

Slik går du frem:

For at vi skal kunne beregne næringsstoffinntaket ditt så nøyaktig som mulig, er det nødvendig at du noterer *alt* du spiser og drikker i løpet av en 4 dagers sammenhengende periode. Perioden onsdag til lørdag (evt. søndag til onsdag) er best, for da får du med én helgedag.

Det er vesentlig at du spiser slik som du pleier i registreringsperioden.

- Angi klokkeslett for hver gang du spiser eller drikker noe.
- Beskriv mat og drikke så nøyaktig som mulig
- *Brød*: Type, navn, grovhet, tykkelse på skiver, antall skiver. Ev. rundstykke, knekkebrød..
- *Fett på brødet*: Type, navn, mengde, lett eller vanlig
- *Pålegg*: Type, mengde, produktnavn, lett eller vanlig
- *Middag*: Type kjøtt, fisk, kjøttfarse-/fiskeprodukt. Produktnavn. Fettprosent.
- *Frukt og grønnsaker*: Rå, kokt eller hermetisk.

- Beskriv hvordan maten er tilberedt.
- Kokt, bakt, stekt, grillet eller varmet i mikrobølgeovn
- Er maten er rensset for skinn og/eller fett?

- Hjemmelagede retter beskrives i detalj, gjerne ved å skrive ned oppskriften bak på arket.
- Notér alt tilbehør, som saus, pickles, rømme, dressing eller krem, med navn/producent. Oppgi også om du bruker sukker på gryn, grøt eller i te.
- Få med alle mellommåltider, samt tilfeldig spising og drikke utenom de faste måltidene.
- Kosttilskudd, som tran, vitamintabletter o.l. skal også noteres, med navn, produsent og mengde.
- Mengder kan beskrives på følgende måte:
 - aller helst skal du veie maten og føre mengden opp i gram
 - hvis du ikke kan veie, kan du angi mengder i husholdningsmål, som
 - spiseskje, glass, desiliter eller antall, alt ettersom hva som er hensiktsmessig
 - oppgi størrelse på glassene du bruker i dl

Eksempel:

Kl	Tirs dag 14 / 1 / 11	Produktnavn/Produsent	Vekt
0730	1 butikkskåret skive kneip	Bakers	30g
	m/ skrapet lag margarin	Soft Soya	
	3 høvelskiver hvitost, 16% fett	Norvegia, Tine	
	1 stor grapefrukt		200g
	1 stort glass lettmeik (Stort glass = 2 dl)	Tine	
1100	1 beger fruktyoghurt	Yoplait Dobbel 0%, mango	125g
	1 melkesjokolade	Freia	100g
	1 kopp svart kaffe		150g
1500	kokt torsk		140g
	3 små potete, kokt		150g
	3 toppede ss revet gulrot		
	1 ss remulade	Idun	
	2 store glass saft	Lerum uten tilsatt sukker	

Kl dag ... / ... / ...	Produktnavn/Produsent	Vekt

Attachment 8: Gluten free brochure



Kostråd til deg som skal spise

Glutenfritt



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August 2011

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2.	<i>Hvem trenger glutenfri kost?</i>	2
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Har du nettopp fått diagnosen cøliaki?

Se kapittel 14 for praktiske tips og råd den første tiden.

1. Hva er gluten?

Gluten er en fellesbenedevnelse på tre forskjellige, men likevel ganske like, proteiner som finnes i hvete, rug og bygg. Vanlig havre kan også inneholde gluten på grunn av forurensning fra andre kornslag. Kornslagene spelt, dinkel, kamut og rughvete inneholder også gluten.

2. Hvem trenger glutenfri kost?

Cøliaki

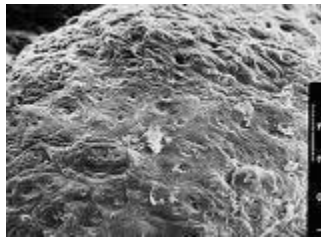
Ved cøliaki skades tarmen ved inntak av gluten, og evnen til å fordøye maten avtar. Dette medfører at en redusert mengde av matens næringsstoffer tas opp som igjen kan føre til magesmerter og underernæring

Hos barn er et vanlig symptom på cøliaki at vekstkurven flater ut.

Hos voksne er de klassiske symptomene på ubehandlet cøliaki jernmangel, diaré og avmagring, mens noen opplever trøtthet og dårlig matlyst. Det er heller ikke uvanlig å ikke ha symptomer i det hele tatt.



Frisk tarm



Skadet tarm

Når de som har fått stilt diagnosen cøliaki konsekvent holder en glutenfri kost, vil tarmen leges. Fordøyelsesproblemene vil avta og kroppen vil kunne utnytte maten på vanlig måte.

Tarmslimhinnen vil alltid reagere på gluten og selv små mengder kan gi tilbakefall, med eller uten symptomer. Derfor må et glutenfritt kosthold følges strengt og vare livet ut.

Det er viktig at ingen starter på glutenfri diett før sikker diagnose er stilt ved tynntarmsbiopsi.

Dermatitis herpetiformis (DH)

Dette er en relativt sjelden hudsykdom med kløende utslett og væskefylte blemmer. Tarmslimhinnen er også angrepet på lignende måte som ved cøliaki, men vanligvis i noe mindre grad. Dette fører i mange tilfeller til underernæring, men sjelden til større problemer med fordøyelsen. Glutenfri kost er en viktig del av behandlingen av DH.

Tarmslimhinnen blir normal på glutenfri kost og hudsymptomene vil ofte bedres, men det kan ta opptil et par år.

Enkelte kan også ha nytte av jodredusert kost, og vil kunne få veiledning i forhold til dette.

Hveteallergi / hveteintoleranse

Ved hveteproteinallergi og hveteintoleranse vil det i tillegg til reaksjon på hvete ofte forekomme kryssreaksjoner på rug og bygg. Derfor brukes ofte glutenfri kost.

Samtidig intoleranse overfor havre er mindre vanlig, men *vanlig* havre kan være forurenset med små mengder hvete som gir reaksjon. Velg derfor havre som er merket ren eller glutenfri. (se s. 7).



Grant Cochrane/FreeDigitalPhotos.net

3. Innholdsdeklarasjon og merking av glutenfrie produkter

Alle ferdigpakkede matvarer skal være merket med en innholdsdeklarasjon, som skal være skrevet på norsk, svensk, dansk eller engelsk. Innholdsdeklarasjonen er det beste hjelpemiddel man har til å vurdere om et sammensatt produkt er glutenholdig.

Merkeforskriften setter særlige krav til merking av allergener. Dette innebærer at en rekke matallergener inkludert gluten/glutenholdige ingredienser alltid skal deklarerer i ingredienslisten, selv om de er tilsatt i ørsmå mengder. Det er en rekke ingredienser som inneholder gluten (se side 10). Matvarer som er merket med svært lavt gluteninnhold eller glutenfritt kan brukes uten at man må sjekke ingredienslisten.

Dessverre er ikke alle matvarer merket med innholdsdeklarasjon. Dette gjelder bl.a. ferskvarer og andre produkter som selges i løs vekt. I slike tilfeller må man forhøre seg hos butikkbetjeningen eller produsenten. **Ikke bruk matvarer med ukjent sammensetning!**

Det forekommer en gang i blant at produsenten endrer oppskrifter slik at tidligere glutenfrie produkter får ny, glutenholdig ingrediens, sjekk derfor deklarasjonen på produkter du kjenner fra tid til annen.

Et nytt, strengere, regelverk for merking av glutenfrie produkter trådte i kraft i 2012. Det nye regelverket innebær at den øvre grensen for innhold av gluten senkes fra 200 mg gluten/kg til 100 mg gluten/kg.

Svært lavt gluteninnhold:

Produkter merket med ”svært lavt gluteninnhold” kan ikke ha et gluteninnhold som overstiger

100 mg/kg i produktet som selges til forbrukeren. Gluteninnholdet i disse matvarene er så lave at de kan trygt brukes av de aller fleste med cøliaki.

Glutenfri:

Produkter merket med ”glutenfri” skal inneholde mindre enn 20 mg gluten/kg ferdig produkt. Produkter som tidligere ble merket ”naturlig glutenfri” skal i henhold til den nye forskriften merkes ”glutenfri”.

Ubearbeidet frukt, bær, grønnsaker, kjøtt og fisk vil ikke bli merket som glutenfrie selv om de er naturlig glutenfrie men kan trygt benyttes, se også Kostosirkelen side 6.



Image: m_bartosh / FreeDigitalPhotos.net

”Kan inneholde spor av...”

Mange matvarer er merket med ”spor av” hvete, gluten eller andre glutenholdige ingredienser. Denne merkingen innebærer ikke at hvete eller andre glutenholdige ingredienser inngår som en del av produktet, men at produktet er laget i omgivelser der det også lages glutenholdige varer. Produksjonsomgivelsene innebærer altså en risiko for at det merkede produktet kan være kontaminert. Erfaring tilsier at disse produktene **kan brukes** av de aller fleste med cøliaki fordi spormengdene er svært små og langt under grenseverdiene som gjelder.



Image: dan / FreeDigitalPhotos.net

4. Hva innebærer et kosthold ved cøliaki?



Kilde Helsedirektoratet.no

Rene råvarer fra matvaregruppene melk, kjøtt, fisk, egg, ris, poteter, grønnsaker, frukt og bær er naturlig frie for gluten. Disse matvarene er en viktig del av et næringsrikt kosthold, og bør inngå i glutenfritt kosthold.

Spis normale mengder kjøtt, fisk, egg og meieriprodukter, som gir protein, vitaminer og mineraler. Grønnsaker, poteter, frukt og bær gir i tillegg karbohydrater og fiber, og bør brukes i større mengder hver dag. Som i sunn kost ellers bør man begrense inntaket av produkter rike på fett og sukker, som ”fast food”, kaker, kjeks, godteri og søt drikke.

5. Havre ved cøliaki

Glutenfri havre / Ren havre

Glutenfri havre tåles av de fleste med cøliaki. Vanlig havre kan være forurenset med gluten fra industriell produksjon og bearbeiding. Det må derfor kun brukes havre og havreprodukter som er merket ”ren” eller ”glutenfri”.

Det anbefales at havre introduseres etter at glutenfri diett er veletablert og pasienten er symptomfri. Eventuelle reaksjoner på havre kan da lettere oppdages og følges opp. Fordi noen kan få magesymptomer på grunn av det høye fiberinnholdet i havre, anbefales gradvis innføring av havre i kostholdet. Bruk av havre kan på en positiv måte bidra til økt fiberinntak i glutenfri kost og kan gi større variasjon i kosten.

For barn anbefaler fagrådet i Norsk cøliakiforening at man venter med å introdusere ren/glutenfri havre til barnet har spist glutenfritt i ca 3-6 mnd.



www.axa.no

6. Laktoseredusert kost

Fordøyelsen av melkesukker (laktose) er ofte nedsatt når tarmen er skadet. Vanlig melk, brunost og iskrem medfører ofte mageknip og mye luft i tarmene.

Laktosefrie melkeprodukter og alle hvitoster inneholder ingen laktose og tåles godt. Syrnede melkeprodukter, som kulturmilk og yoghurt i begrensede mengder, samt laktoseredusert lettmeik, tåles også av de fleste. Etter ca 6 uker tåler de fleste noe laktose, og melk og brunost kan gradvis introduseres i kosten igjen.

Dersom du ikke har hatt mageplager, trenger du neppe å ta hensyn til laktose i kosten.

www.tine.no



7. Oversikt over matvarer som er glutenfrie, samt matvarer som inneholder glutenholdige ingredienser

Matvarer	Glutenfritt/svært lavt gluteninnhold	Glutenholdig, kan ikke brukes
<i>Melk og ost</i>	Alle sorter melk og andre meieriprodukter som Yoghurt, skyr Ost Rømme, kesam, creme fraiche	Yoghurt m/müsli Søst, gomme lagd med glutenholdige matvarer
<i>Kjøtt, fisk og egg</i>	Alle sorter rent kjøtt, innmat, farsevarer uten gluten. Alle sorter ren fisk, lever, rogn, farsevarer uten gluten. Alle sorter skalldyr. Eggeretter uten gluten.	Pølser, panert kjøtt og kjøttfarser tilsatt glutenholdige ingredienser. Leverpostei kan inneholde hvetemel. Panert fisk og fiskefarser tilsatt glutenholdige ingredienser. Fiskekaker o.l. kan være tilsatt glutenholdige ingredienser som kavring/hvetemel Griljert og fritert mat kan inneholde mel og kavring.
<i>Gryn, mel og brød</i>	Flak, gryn og mel av amarant, bokhvete, hirse, mais, ris, soya, tapioka, quinoa og teff. Ren havre (merket glutenfri) Polentagryn, potetmel, potetfiber, sagogryn, kastanjemel ,arrowrot, sesamfrø, solsikkefrø, linfrø, valmuefrø, kokosmasse, sukkerroefiber og psylliumfrøskall. Glutenfrie melblandinger, Glutenfrie varianter av brød, knekkebrød, flatbrød, kjeks, kaker, pølsebrød, rundstykker, kavring og lomper.	Flak, gryn og mel av hvete, rug, bygg og vanlig havre Rughvete, spelt Vanlig havre. Semulegryn, hvetekli, hvetekim Cous-cous, bulgur Vanlig brød, knekkebrød, kjeks, flatbrød og andre bakverk Puffet hvete, puffet havre.

Gryn, mel og brød	<p>Puffet ris, cornflakes uten maltekstrakt,</p> <p>Glutenfri pasta, ris.</p> <p>Barnegrøt: ris- og maisgrøt og andre glutenfrie grøter. Sinlac grøt.</p> <p>Sausejevning av mais.</p>	<p>Vanlig pasta, hveteris, byggris</p> <p>Barnegrøter basert på glutenholdige kornvarer.</p>
Poteter, grønnsaker, frukt og bær	Alle rene varer.	<p>Stuinger o.l. tilsatt glutenholdige ingredienser.</p> <p>Sprøstekt løk kan inneholde hvetemel.</p>
Fett, olje	Olje, margarin, smør, majones, remulade og salatdressing uten gluten.	
Sukker, søtsaker	Søtt pålegg, honning, drops, sjokolade uten glutenholdig kjeks/crisp, ekte marsipan, lakris, lakrisprodukter uten gluten og karamell uten gluten.	Sjokolade/sjokoladepålegg med kjeks/crisp, mandelmasse tilsatt gluten, enkelte lakris- og karamellprodukter, maltekstrakt og konfekt med glutenholdig fyll.
Drikke	<p>Kaffe, te, melk, juice, saft, iste, kakao og smoothie (uten glutenholdig gryn/korn)</p> <p>Øl laget på malt fra glutenfrie kornsorter som hirse, bokhvete, sorghum eller teff.</p>	Smoothie (med glutenholdig gryn/korn)
Diverse	<p>Sauser, gryteretter, supper o.l. uten gluten.</p> <p>Soyasaus uten gluten, buljong uten gluten, krydder og ølgjær uten gluten.</p>	<p>De fleste sauser, gryteretter og supper.</p> <p>Enkelte chipstyper og nøtteblandinger kan være tilsatt kavring/brødsmuler.</p> <p>Maltekstrakt, soyasaus med hvete, buljong med gluten, krydderblandinger tilsatt gluten og ølgjær.</p>

8. Ingredienser

Produsenter er forpliktet til å oppgi om et sammensatt produkt inneholder glutenholdige ingredienser men det krever at man selv vet hvilke ingredienser det gjelder.

	Ingredienser* som inneholder gluten:	Ingredienser* som er glutenfrie
A		Amarant, Arrowrot,
B	Bygg, Brødsmuler	Bakepulver, Bokhvetemel
C	Cous-cous	Carob,
D	Dinkelhvete, Durumhvete	
E		E-nr. (alle er glutenfrie), Emulgeringsmel,
F	Fullkornsmel	Fruktkjernemel, Fortykningsmiddel,
G	Grynmel, Grahamsmel	Glukosesirup av hvete, Glutamat, Glutaminsyre, Glutinous (ris), Glukosesirup (alle typer), Glyserol, Guarkjernemel, Guargum, Glutenfri havre
H	Havre (vanlig), Havrekli, Havrekorn, Havremel, Hvete, Hvetekim, Hveteprotein, Hvetestivelse**	Havre (glutenfri), Hirse, Humle, Hvetestivelse**, Husk (psylliumfrøskall),
J		Johannesbrødkjernemel,
K	Kamut (egyptisk hvete), Kavring, Kim, Kli, Korn, Kruskablending	Kastanjemel, Kikertmel (rent), Klumpforebyggende middel, Kostfiber (produsenten opplyser dersom kostfiber er fra glutenholdige råvarer),
		Linfrø,
M	Malt, Maltekstrakt, Maltsirup	Maltodextrin (fra hvete), Maltarom, Maltose, Maltsukker, Mandelmel (rent), Modifisert stivelse (dekstrin fra hvete), MSG-smaksforsterkere E621 og E637,
N	Nudler	
P	Puffet havre, Puffet hvete	Polentagryn, Potetfiber, Potetmel, Prekokt, rismel, Psylliumfrø, Psylliumfrøskall (husk)
Q		Quinoamel,
R	Rug, Rugmel, Rugmalt	Ris/villris, Risbakemel, Rismel,
	Semulegryn, Spelt, Strøkavring, Strømel	Soyagryn, Soyamel, Sorghummel, Sesamfrø,
T	Tritikale	Tapioka, Tarakjernemel, Teff,
V		Valmuefrø
Ø	Ølgjær.	

* Listen er ikke komplett. Se www.ncf.no for bredere oversikt.

**Hvetestivelse kan være glutenfri og glutenholdig, avhengig av hvor godt rensset hveten er. Dette opplyses det oftest om på varedeklarasjonen. Ved usikkerhet kontakt produsenten. Hvetestivelse som inngår i glutenfrie produkter er glutenfri.

Stivelse og maltsukker

Både maltsukker, maltodekstrin og maltose er glutenfrie karbohydrater som ikke inneholder gluten. Stivelse kan være utvunnet av hvete, potet, ris eller annet. Dersom det er hvetestivelse skal dette være angitt på pakken. Hvetestivelse er renset for gluten, slik at den kommer under definisjonen ”glutenfri”, og produkter med hvetestivelse inngår derfor i den glutenfrie kosten. Noen få cøliakere med veldig sensitiv tarm kan likevel reagere på hvetestivelse og må utelate dette fra kosten.

Vegetabilsk protein

Hydrolyserte og modifiserte vegetabiliske proteiner, som for eksempel er i buljongpulver og buljongterning, har gjennomgått så store forandringer at de ikke gjenkjennes som gluten og gir dermed ikke tarmskade, selv om det skulle være proteiner fra hvete, rug eller bygg.

Tilsetningsstoffer (E-nummer)

Alle tilsetningsstoffer (E-numre) som er godkjente for bruk i Norge er glutenfrie og hvetefrie. Dette gjelder også alle typer glutamat, glutaminsyre og alle stivelsessorter/fortykningmidler.



Norsk cøliakforening (NCF) gir ut et Ingrediensleksikon som kan bestilles fra deres nettsider www.ncf.no

9. Glutenfrie spesialprodukter

Det finnes en rekke glutenfrie varianter av brød, melblandinger, pølsebrød, kjeks, kaker, knekkebrød osv. Slike glutenfrie spesialprodukter bør erstatte de matvarer som må fjernes fra kosten. Produsenter av glutenfrie produkter er (listen er ikke fullstendig).

- Toro
- Finax
- Semper
- Hammermühle
- Schär
- Holmen Crisp
- Drei Pauly



10. Forhandlere av glutenfrie produkter

De fleste matvarebutikker og helsekostforretninger har glutenfrie produkter i varierende utvalg. Det finnes også flere nettbutikker som har et omfattende sortiment av glutenfrie varer og som leveres per post, f. eks. www.allergikost.no eller www.allergimat.no. For flere nettsteder, se www.ncf.no og klikk på Linker

Mange bakerier produserer glutenfritt brød som kan fås ferskt på bestilling og ellers frossent. Flere spisesteder, også pizza- og hamburgerkjeder, har glutenfrie alternativ.

11. Gode råd for glutenfri baking og matlaging

Her følger noen tips fra erfarne cøliakere som det kan være verdt å ta med seg:

Det viktigste bakerådet: Bruk fiberhusk i all gjærbakst!

Fiberhusk løses i væske i et par minutter og tilsettes melet. Du får en mye bedre deig å arbeide med, og du får et saftigere bakverk som holder seg lenger uten å smule. Bruk 1 ss per ½-1 kg mel. Fiberhusk er psylliumfrøskall som virker ved å øke innholdet av geldannende fibre i brødet.

· Til brødbaking kan du gjerne velge grov brødmix og tilsette linfrø, sesamfrø, hirse, solsikkefrø og/eller bokhvete for å øke fibermengden i brødet. NB! Mengden bør ikke være for stor, for da holder ikke brødet ikke sammen. Opptil 1 dl pr brød går bra, prøv deg frem. For dem som ikke liker ”klumper” i brødet kan man male nøttene før man tilsetter det til brød.

· Frys brødet ferskt hvis du baker mer enn det du trenger for en dag. Del det gjerne opp slik at du kan ta frem mindre mengder om gangen.

· Litt olje i brødet forbedrer holdbarhet og konsistens.

· Bokhvete, hirse, mais, soyabønner og ris finnes som mel, flokker og gryn/bønner, og kan brukes til baking og i matlaging. Det vil øke matens fiberinnhold, næringsinnhold og ikke minst gi variasjon. Ferdig kokte linser kan også tilsettes baksten.

· Pannekaker, vafler, kjeks og kaker kan lages av glutenfri brødmix, gjerne tilsatt fiberhusk.

Varier gjerne ved å tilsette soyamel, bokhvetemel og/eller andre typer glutenfrie gryn eller mel.

· Supper, sauser og stuinger kan jevnes med lys melblanding, f.eks Toro's fin kakemix, eller maisenna.

· Glutenfri panering og strøbrød kan lages av glutenfritt brød som tørkes og males, eller det kan kjøpes ferdig i helsekostbutikken.

· De fleste vanlige oppskrifter på kokosboller, kokosmakroner, kransekake og marengs er glutenfrie.

· Dekk brødformen med smurte strimler av bakepapir så slipper brødet.

· Mange av dine «gamle» oppskrifter kan brukes. Erstatt hvetemel med glutenfritt mel, doble mengden hevemiddel, og tilsett et egg for å få det til å henge bedre sammen. I stedet for egg kan du øke mengden glutenfritt mel i forhold til mengden hvetemel.

· Bruk kjøkkenmaskin til gjærbakst, lag deigen løs og la maskinen arbeide deigen godt.

Deigen kan være klisset, og i stedet for å bake brødene kan de helles rett i brødformer. Ved utbaking av boller og rundstykker kan det hjelpe å fukte hendene med olje eller lunkent vann og hjelpe til med en skje for å få form. Kjevle og bakeunderlag i plast egner seg ekstra godt til glutenfri baking.

· Tørt bakverk kan fuktes litt og varmes i f. eks brødrister. Mange synes glutenfritt brød smaker bedre når det er ristet.

· Mange foretrekker å kjøpe en brødbakemaskin som baker brød på natten. Da kan du få et ferskt brød hver morgen.

12. Oppskrifter

Oppskrifter på glutenfritt bakverk og matretter er det ikke blitt plass til i dette heftet. Det finnes en rekke kokebøker med glutenfrie oppskrifter som du kan kjøpe i bokhandelen. Det finnes også flere nettsteder og blogger med oppskrifter og råd om glutenfri matlaging.

Norsk cøliakiforening arrangerer forskjellige matlagings- og bakekurs.

Et utvalg av glutenfrie kokebøker:

- *Glutenfrie tradisjoner fra hele verden*. Henriette Pecühle (2011) Kolofon.
- *Glutenfri mat godt og sunt. Gjærbakst og kaker*. Else Lill Münter Rolfsen, Ruth Solheim Aag (2007) Kolibri forlag.
- *Glutenfri mat - godt og sunt. Småretter og middager*. Else Lill Bjønnes og Bjørn Wiborg (2010) Kolibri forlag.
- *Kokebok for deg som flytter hjemmefra*. Else Lill Bjønnes (2006) Kolibri forlag.



13. Litt mer informasjon

- om cøliakiforeningen

Norsk Cøliakiforening (NCF) er en interesseorganisasjon/pasientforening for mennesker med cøliaki eller dermatitis herpetiformis (DH). NCF ble opprettet i 1974. De har utarbeidet flere informasjonsbrosjyrer om cøliaki og glutenfritt kosthold og utgir medlemsbladet Cøliaki-nytt fire ganger årlig. De arbeider kontinuerlig for å ivareta medlemmenes interesser gjennom informasjon, opplysning og bidrag til forskning. De arbeider for å bedre tilgangen til glutenfrie produkter og bevisstgjøring av produsenter på betydningen av korrekt deklarerings av alle matvarer.

NCF har en informativ hjemmeside på internett som oppdateres jevnlig og har lenker til andre nyttige hjemmesider: www.ncf.no

Du kan også kontakte foreningen per brev eller telefon:

Norsk Cøliakiforening, Pb 351 – Sentrum, 0101 Oslo. Telefon: 22 40 3900

- om lokallaget

NCF har et aktivt fylkeslag i Hordaland og Sogn og Fjordane, som arrangerer bl.a. møter og bakekurs. De har opprettet kontaktpersoner som bistår med hjelp til nydiagnostiserte cøliakere.

- om cøliaki-poliklinikken

Du kan også ringe cøliakipoliklinikken på Haukeland universitetssykehus: 55 97 29 40, tirsdager klokken 16-18. Telefonen bemannes av frivillige fra cøliakiforeningen.

- om grunnstønad:

Diagnosen cøliaki gir automatisk rett til grunnstønad for å dekke merutgifter til matvarer. For tiden (juni 2011) gjelder sats 2: 948 kr/mnd, for barn opp til 3 år og sats 4: 1833 kr/mnd, for alle andre.

14. Første uken på glutenfritt

Kjøp ferdigbakt glutenfritt brød til hele første uken, skjær i skiver og frys ned.

Glutenfri baking krever trening. Du kan ikke regne med å få godt bakeresultat de første gangene du prøver, så sørg for å ha nok brød, knekkebrød og kjeks den første tiden. Mesteparten av maten kan du kjøpe i dagligvarebutikken.

Handleliste med glutenfrie matvarer

- Potet og ris
- Glutenfri pasta og glutenfritt brød/knekkebrød
- Rene kjøttprodukter (inkl. karbonadedeig og kjøttdeig)
- Kjøtt (rent) fra kylling, kalkun og andre fugler
- Kjøtt (rent) fra fisk og skalldyr
- Egg
- Hvitost, brunost og de fleste smøreoster
- Syltetøy
- Melk og melkeprodukter (yoghurt, rømme, fløte etc, ev laktosefrie alternativ)
- Frukt og bær
- Grønnsaker og rotfrukter
- Margarin, lettmarjarin, smør, flytende marjarin og olje
- Salt, pepper og alle rene urtekrydder
- **Før jevning:** Maisenna eller potetmel



Husk å alltid sjekke
innholdsdeklarasjonen!

- bibliotek, bokhandel eller internett

En glutenfri kokebok er god å ha. Foruten oppskrifter finner du informasjon om andre korn- og melsorter som kan erstatte hvetemel, fibertilskudd og bakeråd. Mye av denne informasjonen finner du også på internett. Start på hjemmesiden til cøliakiforeningen: www.ncf.no og benytt lenkene derfra.

-cøliakiforeningen

Kontaktpersonene i cøliakiforeningen vet at det kan være tøft å få diagnosen cøliaki, spesielt hvis baksten slår feil og maten smaker annerledes. Kontakt de dersom du har spørsmål om glutenfri matlaging eller om du bare vil prate litt.

- trygdekontoret

Kontakt trygdekontoret for å få sendt inn søknad om grunnstønning så fort som mulig, slik at du raskt får utbetaling av merkostnader i forbindelse med dietten. Diagnostidspunktet regnes som dietstart og du får betalt fra denne dagen. Det er også mulig å søke trygdekontoret om refusjon av utgifter til tannskader som har sammenheng med cøliaki.

-”glutenfri sone”

For å unngå at smuler fra vanlig brød kommer i kontakt med glutenfritt brød, kan det være lurt med egen brødboks til glutenfritt brød, egen skjærefjøl, egen brødkniv og kanskje en egen brødkurv. Dersom det brukes mye, kan det være praktisk med en egen brødrister til glutenfritt brød. Eventuelt kan man bruke toastposer utenpå brødsnivene i brødristeren. Toastposer er også praktisk å ha med seg på reise (kan kjøpes blant annet på allergimat.no og allergikost.no).

Attachment 9: Additional information for group A

GLUTENFRITT UTEN HVETESTIVELSE OG SPOR AV (NOEN EKSEMPLER):

- **Semper:** Semper produkter som inneholder hvetestivelse er merket med rød ring i venstre hjørne. Grov Mix, chips chili og sitron, grovt knekkebrød, fusilli pasta, flakes & fibre frokostblanding, fin mix, brownies, bondeknekkebrød, landknekkebrød, kick natural frokostblanding, havreknekkebrød, havregryn, linguine pasta, linfrøknekkebrød, pasta til lasagne
- **Schar:** Surdeigsbrød, baguetter, minibaguetter, knekkebrød, ciabatta rustica, wraps, brødet vital, lyst skivet brød, flerkornsbrød, landbrød, mørk melblanding, brødmix
- **Finax:** Crunch frokostblanding, melmix melkefri
- **Holmen Crisp:** Jyttemjøl original, teff, fibratEFF, mix
- **Toro:** Glutenfri lasagne, glutenfri brun saus, glutenfri hvit saus, lys melblanding, vafler, knekkebrød, havrebrød
- **Fria:** Har hvetestivelse i det aller meste
- **Bakers:** Kjernebrød, loff

Obs: Dette er bare noen forslag. Det finnes flere glutenfrie produkter uten hvetestivelse og «spor av gluten».

Attachment 10: Low FODMAP brochure



Kostråd ved irritabel tarm

FODMAP-reduisert kost

I denne brosjyren finner du informasjon om FODMAP og tips til hvordan en FODMAP-reduisert kost kan settes sammen.

Hva er irritabel tarm?

Irritabel tarm, eller irritable bowel syndrome (IBS), er en tilstand som kan medføre ulike plager i mage og tarm. Typiske symptomer er kvalme, mageknip, magesmerter, oppblåsthet, utspilt mage og luft/gass og rumling i tarmen. Man kan også oppleve avføringsforstyrrelser som diaré, forstoppelse eller vekslende løs og hard avføring. Symptomene kan komme og gå i perioder. Stress og bekymring kan forverre symptomene, og for noen kan plagene utløses eller forverres av mat eller drikke. Irritabel tarm kan være plagsom, men ikke farlig. Det er ikke kjent hva som er årsakene til irritabel tarm. Tilstanden er utbredt, og oppleves hos 15-20% av befolkningen.

Generelle råd ved irritabel tarm

Mange opplever bedring når de følger disse rådene:

- Regelmessige måltider med sunn og variert kost
- Flere små måltider er bedre enn få store
 - o 4-6 måltider daglig, med ca. 3-4 timer mellom hvert måltid
- Ro rundt måltidet
- Regelmessig liv med god balanse mellom aktivitet og hvile
- Tilskudd av geldannende fiber, som ViSiblin, FiberHusk, Psyllium og Benefiber.

NB! Viktig med rikelig væskeinntak i tillegg.

- Mat som **kan** gi problemer:
 - o Fet mat
 - o Stekt mat
 - o Røkt og sterkt saltet mat
 - o Sterkt krydret mat
 - o Mye kostfiber
 - o Mat med mye tungtfordøyelige karbohydrater (FODMAPs)
 - o Kaffe og annen koffeinholdig drikke (te, cola og energidrikker)

© Nasjonal Kompetansetjeneste for Funksjonelle Mage-tarm sykdommer
Avdeling for klinisk ernæring, Haukeland universitetssjukehus. April 2015

FODMAP-redusert kost

Australske forskere (Peter Gibson og Sue Shepherd) har utviklet en kost, «**FODMAP-redusert kost**», som har vist seg å redusere plagene hos mange som sliter med irritabel tarm.

Hva er FODMAP?

FODMAP er en forkortelse for fermenterbare oligo-, di- og monosakkarider og (and) polyoler. Dette er karbohydrater som tynntarmen kan ha vanskeligheter med å bryte ned og absorbere. Når de ufordøyde karbohydratene kommer til tykktarmen, vil de trekke til seg væske og forårsake gjæring. Dette kan gi problemer med gassdannelse, magesmerter, oppblåsthet, diaré og/eller forstoppelse.

Slik går du fram

En rekke studier har vist at flestparten av alle som lider av irritabel tarm har god effekt av FODMAP-redusert kost. Dersom du vil teste om denne dietten kan ha effekt hos deg, anbefales det å unngå/begrense matvarer med høyt FODMAP-innhold i 4-8 uker.

Se tabelloversikt fra neste side, hvor matvarene er kategorisert i rød, oransje og grønn kolonne. Matvarer i grønn kolonne har lavt innhold av FODMAP og kan brukes. Motsatt har matvarer i rød kolonne høyt innhold av FODMAP, og bør unngås/begrenses. Matvarer i oransje kolonne kan brukes i moderate mengder. For å få ideer om hvordan kosten kan settes sammen i denne perioden, -se siste del av brosjyren, side 11-19. Der finner du menyforslag og oppskrifter.

Hvis du ikke merker noen bedring/effekt innen 4-8 uker, har det ingen hensikt å fortsette med dietten. Blir du bra bør du på en systematisk måte forsøke og reintrodusere de matvarene du har fjernet fra kosten, slik at du til slutt får et «skreddersydd» kosthold som holder magen i orden, og ikke er mer begrenset enn det behøver å være. Se side 9-10, som handler om reintroduksjon av FODMAPene.

Kilder til FODMAPene finnes i matvaregruppene som er avbildet på venstre side av svart linje.



Bilde: Redigert kostholdssirkel Helsedirektoratet.

FODMAP-redusert kost er ikke det samme som lavkarbo eller glutenfri kost!

Tabelloversikten viser matvarer med høyt, middels og lavt FODMAP-innhold.

Matvaregruppe	Høy FODMAP Unngås/brukes i svært små mengder	I mindre mengder	Kan brukes i moderate mengder
Frukt og bær	Aprikos Eple Fersken Fiken Kirsebær Lychee Mango Nektarin Persimon (sharon) Plommer/ svisker Pære Vannmelon Bær: Bjørnebær Boysenbær Uansett frukttype: Fruktjuice Større porsjoner frisk frukt og smoothie. Hermetisk frukt i egen juice Tørket frukt/bær (se unntak i gul kolonne)	Grapefrukt Granateple Rambutan Tørket frukt/bær: Banan Rosiner Tranebær Kokos	Ananas Appelsin Banan Cantaloupe Dragefrukt Druer Durian Honningmelon Kaktusfiken Kiwi Klementin Papaya Pasjonsfrukt Rabarbra Sitronsaft Stjernefrukt Bær: Blåbær Bringebær Jordbær

Grønnsaker	Artisjokk Asparges Blomkål Hvitløk Løk, hvit og rød Purre (hvit del) Sopp Sukkererter Stangselleri Vårløk (hvit del) Tørkede belgfrukter: - erter - bønner - linser	Aubergine Artisjokk (hermetisk) Avokado Brokkoli Erter Gresskar Butternut Mangold (sølvbete) Rødbete Savoykål	Agurk Alfalfa spirer Aspargesbønner Bønnespirer Fennikel Gulrot Gresskar Hokkaido Kålrot Mais Noriark Okra Oliven (sorte og grønne) Paprika (Grønn) Paprika * (Rød) Pastinakk Potet Purre (grønn del) Rosenkål Reddik Salater: Bok Choy/ Pak Choy Ekebladsalat Eskarollsalat/ Endive Ruccola Spinat
Urter/krydder	Hvitløk Krydderblandinger og marinader med hvitløk og/eller løkpulver.		Basilikum Chili* Estragon Gressløk Ingefær Koriander Persille Rosmarin Timian

*Inneholder kapsikum som kan gi magetrøbbel for noen.

Matvaregruppe	Høy FODMAP Unngås/brukes i svært små mengder	Lav FODMAP Egnede alternativer
Melkeprodukter/ melkeerstatere	Melk (fra alle pattedyr) Yoghurt Fløte Rømme Brunost og prim Ferske og myke hvite oster (og kremoster) Soyamelk av hele soyabønner Iskrem	Laktosefri melk Laktosefri yoghurt Laktosefri fløte Laktosefri rømme Laktosefri kesam Faste hvite oster (norvegia o.l.) Lagrede hvite oster (brie, camembert, roquefort etc.) Cottage cheese 4 ss Mozzarella Chevre ,Feta Kokosmelk Soyamelk av soyaprotein Rismelk Iskrem basert på laktosefri melk/fløte/. Rismelk, eller sorbet og saftis.
Sukker/søtstoff	Fruktose (fruktsukker) Høy fruktose maissirup Honning Isomalt (E953) Laktitol (E966) Maltitol (E965) Mannitol (E421) Sorbitol (E420) Xylitol (E967)	Sukker (sukrose) Glukose (druesukker) Sirup, lønnesirup, ris malt (Kunstige) søtstoff som ikke ender på –ol Stevia Aspartam
Kornprodukter	Større mengder: Hvete Rug Byggryn (bygg) <i>(som hovedingrediens i brød, knekkebrød, bakverk, pasta, kornblandinger)</i>	Glutenfri havre < 25 g per porsjon Bokhvete < 25 g per porsjon Mais/ polenta Ris Quinoa Brød, pasta og kornvarer som er glutenfrie og/eller basert på ovenfor nevnte kornsorter.

FODMAPs er en gruppe karbohydrater.

Rent kjøtt, fjærkre, fisk, egg og fett/olje inneholder ikke FODMAP.

Mer om ulike typer FODMAP

Hva er forskjellen mellom FODMAP og andre karbohydrater?

Karbohydrater er energirike molekyler som fungerer som energikilde og energilager hos alle planter og dyr. De er bygget opp av én eller flere sukkerenheter som er bundet sammen i korte eller lange kjeder. Under fordøyelsen må karbohydratene i kosten brytes ned til enkle suktermolekyler før de kan absorberes i tynntarmen og nyttiggjøres av kroppen. Det som kjennetegner FODMAP-karbohydratene, er at de er små (består av én eller noen få sukkerenheter), absorberes dårlig og gjæres lett.

Karbohydrater som vanligvis ikke gir besvær:

Glukose (druesukker) er ett enkelt suktermolekyl som lett absorberes i tynntarmen.

Tåles godt ved IBS. Finnes i frukt og bær.

Sukrose (vanlig sukker) består av et fruktose- og et glukosemolekyl som er bundet sammen. Fordøyes og absorberes lett, men inntaket bør begrenses av hensyn til den generelle helsen.

Stivelse er lange kjeder av glukose. Disse brytes raskt ned og absorberes fullstendig i tynntarmen og er derfor uproblematisk ved IBS. Finnes i kornvarer, pasta, rotgrønnsaker og poteter.

Kostfiber er langkjedede karbohydrater som ikke brytes ned i tynntarmen. Finnes i grove kornvarer, grønnsaker og frukt. Kostfiber er viktig for tarmfunksjonen og bidrar til å gi avføringen riktig konsistens. Vi skiller mellom vannløselige og ikke-vannløselige fibertyper. Vannløselig fiber er mest gunstig ved IBS.

FODMAP:

Fruktose (fruktsukker) er et **monosakkarid**, det vil si at det består av bare ett suktermolekyl. Finnes i frukt, bær, fruktjuice og honning, ofte sammen med glukose (Tabell 1). Fruktose absorberes godt sammen med like store mengder glukose, og 30-40% av befolkningen (både friske og personer med IBS) absorberer ikke overskudd av fruktose. Inntak av mat som inneholder mer fruktose enn glukose, kan skape problemer hos dem som lider av irritabel tarm.

Laktose (melkesukker) finnes i melk og melkeprodukter (Tabell 2). Laktose er et **disakkarid** og består av to suktermolekyler (glukose og galaktose) som er bundet sammen. Under fordøyelsen spaltes de to sukkerenhetene fra hverandre ved hjelp av enzymet laktase, som produseres i tarmslimhinnen. Mangel på enzymet fører til laktosemalabsorpsjon. Genetisk betinget laktasemangel er svært utbredt på verdensbasis, og forekommer ofte hos innvandrere, men sjelden blant etnisk norske. Tarminfeksjoner og skader på tarmen kan også føre til laktasemangel, som regel av forbigående type.

Sorbitol og andre søtstoff som ender på -ol, som mannitol, maltitol og xylitol, er **polyoler** (også kalt sukkeralkoholer). Disse absorberes ikke fullstendig i tynntarmen og større inntak kan forårsake diaré og luftplager hos alle. Ved irritabel tarm kan også mindre inntak gi symptomer. Sukkeralkoholer forekommer naturlig i visse typer frukt og grønnsaker og brukes i sukkerfri tyggegummi, drops og pastiller (Tabell 3).

Fruktaner er korte kjeder av fruktose og tilhører gruppen **oligosakkarider**. Finnes i løk, hvete og rug. **Galaktaner** er også **oligosakkarider** og finnes i belgfrukter. Disse stoffene brytes ikke ned av enzymene i tynntarmen, men blir i stedet mat for tykktarmsbakteriene, som produserer gass (Tabell 4).

Tabell 1: Mat som inneholder overskudd av FRUKTOSE
Frukt og bær Boysenbær Epler Fiken Kirsebær Mango Pærer Vannmelon
Grønnsaker Asparges Sukkererter
Søtstoff Fruktose Honning Høy fruktose maissirup
Gir et høyt totalinntak av fruktose
Store porsjoner av Frukt Tørket frukt Fruktjuice
Inneholder ofte fruktose
Matvarer merket ”Naturlig lett” ”Naturlig søtet”

Tabell 3: Mat som inneholder SORBITOL og/eller andre POLYOLER
Frukt og bær Aprikoser Bjørnebær Epler Fersken Kirsebær Moreller Nektariner Plommer Pærer Svisker Vannmelon
Grønnsaker Avokado Blomkål Stangselleri Sopp Sukkererter
Søtstoff Isomalt (E953) Laktitol (E966) Maltitol (E965) Mannitol (E421) Sorbitol (E420) Xylitol (E967)

**Tabell 2: Mat som inneholder LAKTOSE
Begrenses ved laktosemalabsorpsjon**

Melk og melkeprodukter
Melk (fra alle pattedyr)
Yoghurt
Fløte
Rømme
Brunost
Prim
Ferske og myke hvite oster
Iskrem

Tabell 4: Mat som inneholder

FRUKTANER og/eller GALAKTANER

Frukt

Nektarin
Persimmon (kaki/sharon)
Plommer
Rambutan
Vannmelon

Grønnsaker

Artisjokk
Bønner (tørkede)
Erter
Fennikel
Hvitløk
Kikerter
Kål
Linser
Løk
Purre
Sjalottløk

Korn (som hovedingrediens i brød/bakverk, pasta, grøt, müsli)

Spelt
Hvete
Rug

Tilsetningsstoffer

Frukto-oligosakkarider (FOS)
Galakto-oligosakkarider (GOS)
Oligogalaktose
Oligofruktose
Inulin

Hvorfor tåler noen FODMAP dårligere enn andre?

Sorbitol, fruktaner og galaktaner absorberes dårlig av alle mennesker, og fruktosemalabsorpsjon er like vanlig hos friske personer som hos individer med IBS. Folk flest tåler likevel FODMAP godt.

Grunnen til at personer med irritabel tarm får plager av FODMAP, kan være følgende:



Tarmoverfølsomhet for gassproduksjon

Ved irritabel tarm er tarmen mer følsom for gassen som blir produsert, og den trykkøkningen i tarmen som gassen forårsaker, oppleves mer smertefull og ubehagelig.

Bakteriell overvekst i tynntarmen

Noen av de bakteriene som normalt er lokalisert i tykktarmen, kan bevege seg over i tynntarmen. Dette kalles bakteriell overvekst i tynntarm og forekommer hos opptil 50% av de som har irritabel tarm. Når FODMAP gjæres av bakterier i tynntarmen, vil gassen som produseres, øke trykket i et smalt parti av tarmen og derfor forårsake mer ubehag og smerte.

Reintroduksjon av FODMAP-grupper

Da man ikke nødvendigvis reagerer på alle FODMAP-gruppene, anbefales det å teste toleransen for hver enkelt gruppe. Før du gjør dette er det anbefalt å følge FODMAP- redusert kost i 4-8 uker, til du er symptomfri, for så å innføre én og én FODMAP-gruppe.

Det er viktig å reintrodusere gruppene enkeltvis på en systematisk måte for å finne din egen toleransegrense og hvilke typer FODMAP du reagerer på.

Forslag til reintroduksjon

Det er opp til den enkelte hva man ønsker å gjeninnføre først. Det kan være en idé å starte med det man har savnet aller mest. Det anbefales å starte med en liten mengde av en matvare som kun inneholder en type FODMAP om gangen.

Se forslag til gode testmatvarer i tabelloversikt under, og ellers på side 7-8.

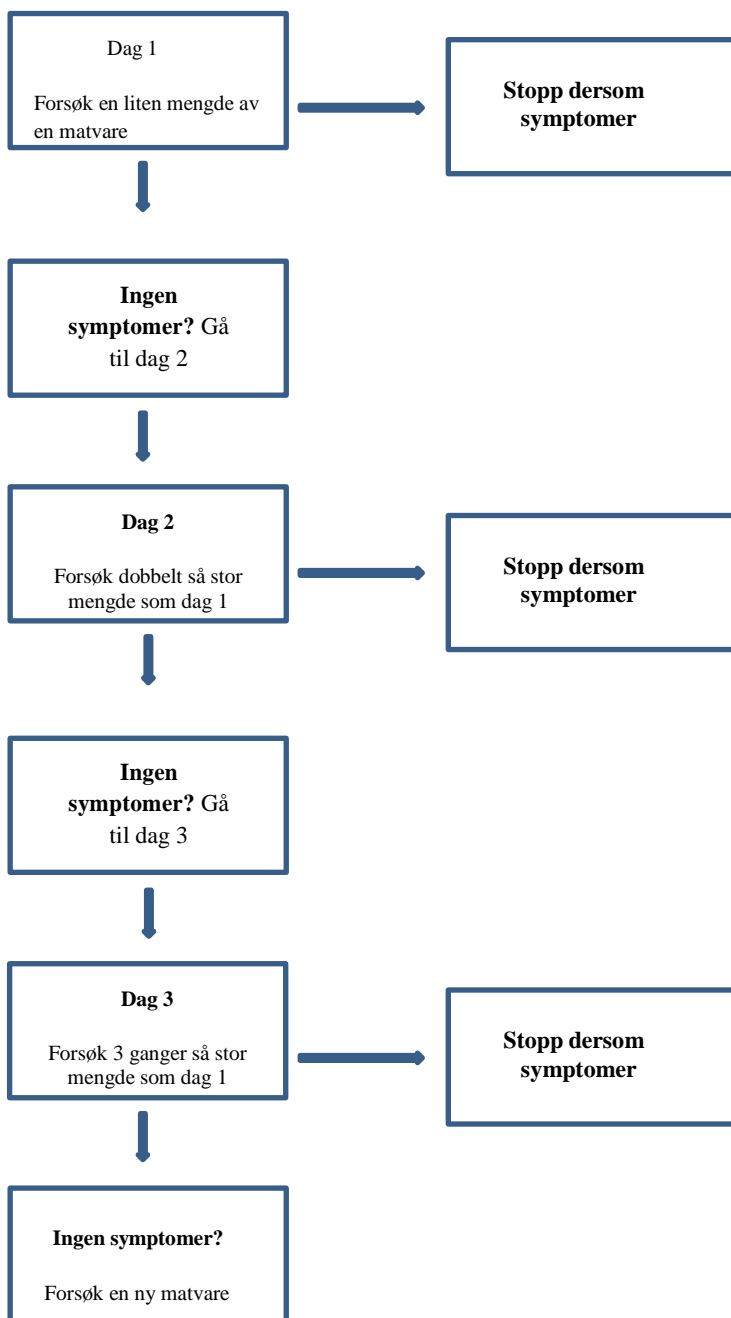
Følgende matvarer egner seg godt til testing fordi de inneholder mye av én FODMAP-type og lite eller ingenting av de øvrige. Start forsiktig og øk etter hvert til normale porsjonsstørrelser:

FODMAP-gruppe	Testmatvare
Fruktose (tabell 1):	¼ Mango eller 1 ts honning
Laktose (tabell 2):	125 ml melk (søtmelk) eller 1 skive brunost (15g)
Polyoler (tabell 3):	2 tørkede aprikoser, 1 stk sukkerfri tyggegummi eller et par sukkerfrie pastiller (med sorbitol)
Fruktaner (tabell 4):	1 ss tilberedt løk, purre, eller 1 fedd hvitløk.
Galaktaner (tabell 4):	2 ss bønner eller linser
Fruktose og polyoler	En kombinasjon av fruktose og sorbitol kan tolereres dårligere enn gruppene enkeltvis. For å teste toleransen for en kombinasjon, kan pære benyttes

Ved laktoseintoleranse

Dersom du gjennom utprøvingen finner ut at du tolererer laktose dårlig, kan du ha nytte av preparater med laktaseenzym. Disse selges reseptfritt på apotek, og finnes i flere varianter. *Kerutabs* tabletter og *Lactrase* kapsler virker slik at man tar 1-3 tabletter/kapsler i forbindelse med måltid som inneholder laktose. Med disse vil du kunne nyte et måltid på restaurant, i selskap, ved festlige anledninger eller på ferie uten å bli dårlig på grunn av laktosen.

Følgende modell kan brukes når du tester en ny matvare:



Gjennomfører du tre hele dager med en ny matvare uten å få symptomer, kan matvaren på sikt kunne inngå i kosten igjen. Test kun nye matvarer når du ikke har symptomer. Når du skal teste neste matvare anbefales det å ta ut den matvaren du har testet av kosten igjen. Dette er viktig fordi summen av de to matvarene med mye FODMAP kan overstige din toleransegrense for total mengde FODMAPs. Dette kan illustreres som et beger som flyter over. Det kan være at man tåler små mengder fruktaner og fruktose, eller fruktaner enkeltvis, men når alle kombineres kan den totale mengden få begeret til å flyte over, og man får symptomer.

Praktiske råd ved FODMAP-redusert kost

Når du reduserer inntaket av FODMAP, er det fortsatt mulig å ha et sunt og variert kosthold. Dette er en veileder til hvordan du selv kan sette sammen måltider som har et lavt innhold av FODMAP.

Frokost/Lunsj/Kvelds

- 2 skiver glutenfritt brød/knekkebrød/rundstykker med pålegg.
- Glutenfri havregrøt med vann/laktosefri melk (og eventuelt bringebær/ jordbær/ blåbær/banan)
- Glutenfri havregryn eller glutenfri cornflakes med laktosefri melk/ yoghurt/ Biola
- Omelett (med skinke, kokt potet, og FODMAP-reduserte grønnsaker som paprika, tomat, vårløk (grønn del), squash, oliven)
- Salat
 - o FODMAP-reduserte grønnsaker og frukt, eks salat, tomat, agurk, gulrot, vårløk (grønn del), oliven, appelsin, druer og honningmelon
 - o Glutenfri pasta
 - o Kylling/kjøtt/egg/fisk/sjømat
 - o 1 ss gresskarkjerner

Middag

- Rene produkter av hvitt og rødt kjøtt, egg, fisk og sjømat
- o Les innholdsliste på blandingsprodukter- begrensn ingredienser med mye FODMAP
- Poteter, ris, glutenfri pasta, risnudler, quinoa
- Pai/pizzabunn av glutenfritt mel.
- Eggeretter
- Pannekaker lagd med glutenfritt mel og laktosefri melk
- Hjemmelaget suppe av grønnsaker, kjøtt mm.
- Stekte grønnsaker/salat (se under oppskrifter)

Tilsett smak til maten:

- Oljer til steking/marinade
- Sitronsaft
- Laktosefri rømme/kesam – med og uten urter
- Friske urter, som for eksempel: basilikum, koriander, persille, rosmarin, timian
- Chili, Ingefær, salt og pepper
- Lønnesirup
- Vårløk (den grønne delen)



Foto: www.matprat.no

- Olje med hvitløksmak (legg store biter hvitløk i olivenolje, la den trekke en ukes tid. Ta vekk hvitløksbitene før du bruker oljen i matlaging)
- Alternativt; -stek hvitløken i oljen, og ta ut hvitløken før du tilsetter resten av ingrediensene.

Påleggforslag

- Kjøttpålegg: kokt skinke, skinkestek, spekeskinke, kalkun- og kyllingskinke naturell
- Egg
- Reker og annen sjømat
- Rene fiskepålegg som røkelaks, tunfisk, påleggslaks og sardiner
- Kaviar
- Majones
- Ost: Hvitost, brie, cottage cheese, cheddar, edamer, mozzarella, camembert og fetaost.
- Syltetøy av bringebær, jordbær og blåbær.
- Lønnesirup
- Peanøttsmør
- Banan
- Agurk, tomat, paprika, salat



Snacks

Nøtter/frø

- Hasselnøtter, 10 stk
- Mandler, 10 stk
- Macadamia, 20 stk
- Peanøtter, 28 g
- Pekan, 10 stk
- Valnøtter, 10 halve
- Pinjekjerner, 1 ss
- Chiafrø, 2 ss
- Gresskarkjerner, 2 ss
- Solsikkefrø, 1 ts
- Sesamfrø, 1 ss
- Sorbetis laget av lav-FODMAP frukt.
- 1 glass smoothie av lav-FODMAP frukt som banan og bær, og laktosefri yoghurt og eventuelt glutenfrie havregryn
- Tortillachips, potetchips med salt/pepper.
- Glutenfrie kjeks og kaker
- Fruktsalat med laktosefri yoghurt og lønnesirup
- Riskaker med peanøttsmør og banan
- Mørk sjokolade
- Pannekaker og vafler med glutenfritt mel og laktosefri melk
- Glutenfri havrekjeks med nøtter og mørk sjokolade
- Haribo Eldorado vingummi.
- Mentos mint, Polo peppermyntepastiller, Wrigleys tyggegummi med sukker.



Mengde frukt: Det anbefaler maks 2-3 porsjoner à 100g med lav FODMAP frukt daglig, da fruktose i større mengder kan gi symptomer

Frukt og bær, lav FODMAP	Opp til i en porsjon	Gønnsaker, lav FODMAP	Opp til i en porsjon
Ananas	140 g	Agurk	65 g
Appelsin	130 g	Alfalfa spirer	20 g
Banan	100 g	Artisjokk(hermetisk)	30 g
Dragefrukt	330 g	Aspargesbønner	120 g
Druer	150 g	Aubergine	40 g
Durian	100 g	Avokado	20 g
Grapefrukt	80 g	Brokkoli	50 g
Granateple	40 g	Bønnespirer	50 g
Honningmelon	135 g	Fennikel	100 g
Cantaloupe	160 g	Gulrot	60 g
Kaktusfiken	166 g	Gresskar, Butternut	30 g
Kiwi	150 g	Gresskar, Hokkaido	60 g
Klementin	85 g	Kålrot	100 g
Pasjonsfrukt	100 g	Mais	40 g
Papaya	140 g	Mangold (sølvbete)	115 g
Rabarbra	130 g	Noriark	2 stk
Rambutan	30 g	Okra	100 g
Sitronsaft	1 ss	Oliven, sorte og grønne	60 g
Stjernefrukt	94 g	Paprika (Grønn)	100 g
Bær:		Paprika (Rød)	50 g
Blåbær	60 g	Pastinakk	60 g
Bringebær	90 g	Potet	120 g
Jordbær	140 g	Purre (grønn del)	100 g
		Rosenkål	115 g
		Reddik	40 g
		Rødbete	20 g
		Savoykål/ Savoy cabbage	35 g
		Salater	
		Bok Choy/ Pak Choy	160 g
		Eskarollsalat/ Endive	40 g
		Ruccola	35 g
		Ekebladsalat	35 g
		Spinat	150 g
		Sellerirot	35 g
		Squash	100 g
		Søtpotet	70 g
		Tomat	120 g
		Vannkastanjer	55 g
		Vårløk (grønn del)	1 bunt



Foto:www.frukt.no

Tips! Er noen av fruktene eller grønnsakene ukjente for deg? Søk de opp i *frukt.no* sitt leksikon for å se bilde.

Vær oppmerksom på

- Ikke alle glutenfrie produkter er lav-FODMAP. Veldig ofte tilføres eple eller annet som er høy-FODMAP for bedre smak osv. Sjekk ingredienslisten.
- Konsentrert fruktjuice, f.eks. fra eple og pære, brukes iblant som søtstoff.
- Dipper og dressinger inneholder ofte løk og hvitløk.
- Smakstilsatt vann kan inneholde fruktose - les innholdsfortegnelsen.
- Yoghurt kan være tilsatt fruktose.
- Inulin er en fruktantype og brukes iblant som fiber eller prebiotikum i yoghurt, brød eller müsli.
- Dersom du reagerer på mye kostfiber, begrensn matvarer med mye fiber, og velg heller fine produkter enn grove. En gradvis økning av fiber kan bedre toleransen.

På **varedeklarasjonen** skal alle ingrediensene oppgis i rekkefølge etter vekt. Den ingrediensen det er mest av nevnes først, og den det er minst av til sist. Bruk denne kunnskapen når du skal vurdere om en matvare kan inngå i kostholdet ditt. Små mengder FODMAP går som regel bra.

For mer inspirasjon, informasjon, matvarelistor og oppskrifter:

Helse Bergen: Nasjonal Kompetansetjeneste for Funksjonelle Mage-tarm sykdommer.
www.helse-bergen.no/nkfm

Monach University: <http://www.med.monash.edu/cecs/gastro/fodmap/>

Til mobil: **LowFODMAPdiet App** fra Monach University.

Bøker på norsk:

Stine Junge Albrechtsen, Mette Borre, Lisbeth Jensen, Marianna Lundsteen Jacobsen & Cæcilie Gamsgaard Seidel: For deg med irritabel tarm. LowFODMAP-dietten gir ro i magen. Iris forlag 2014

Cecilie Hauge Ågotnes: LavFODMAP. God mat for sensitive mager. Aschehoug 2015

Julianne Lyngstad: LavFODMAP. En komplett håndbok for deg med sensitiv mage. Frisk forlag 201

Et lite utvalg oppskrifter

Scones (8-10 stk.)

6 dl lys, glutenfri melblanding (for grovere scones kan man erstatte ca 50% av lys melblanding med grov glutenfri melblanding).

2 dl glutenfri havremel/ havregryn

2 ts bakepulver

1 ts sukker

0,5 ts salt

100 g margarin (kan reduseres)

Litt solsikkefrø eller gresskarkjerner

4 dl laktosefri yoghurt

1 egg

Slik gjør du:

Bland alt det tørre og smuldre inn margarin. Tilsett solsikkefrø/gresskarkjerner, egg og yoghurt. Rør raskt sammen.

Del deigen i 4 like store deler, lag et stort kryss på midten (så brytes de lett når de er ferdig) eller lag 8-10 scones.

Stekes ved 250 °C i ca. 20 minutter.

(Denne oppskriften kan brukes til å lage hamburgerbrød, pølsebrød mm)

Banan og havregrynspannekaker (1 porsjon)

Mos ½ eller 1 liten banan i en skål, og rør inn 1 egg og 1 neve glutenfri havregryn/havremel (ca 25 g). Fordel røren på to mellomstore pannekaker/ lapper i en panne og stek på middels varme i ca 1 min hver side. Spises alene eller med eks. pålegg som cottage cheese og blåbærsyltetøy.

Vafler og pannekaker: Ta utgangspunkt i en vanlig oppskrift og bytt ut hvetemel med ca 2/3 glutenfritt mel og 1/3 havremel. Melken erstattes med laktosefri melk.

Stekt ris (2 porsjoner)

4 dl kokt langkornet middagsris

200 g skinke

1 gulrot

1 vårløk (den grønne delen)

50 g maiskorn

2 ss rapsolje

1 egg

Litt salt og pepper

Slik gjør du:

1. Del skinke og gulrot i terninger, og vårløk i skiver.
2. Varm wokpannen/stekepannen. Stek skinken i halvparten av oljen. Ha i kokt ris og la det steke til det er gyllent. Bland inn grønnsakene og la det surre i 2 minutter.
3. Lag et hull i midten av risblandingen og ha i resten av oljen og egg. Rør godt.
4. Smak til med salt og pepper.

TIPS: Risen som brukes i stekt ris bør være avkjølt, så den ikke blir "grøtete". En panne med slippbelegg krever mindre stekefett. Varier gjerne med kjøtt og grønnsaker som for eksempel renskåret svinekjøtt, reker/ scampi, kylling, paprika, grønne bønner, ingefær. Du kan også bruke frossen grønnsaksblanding, men vær obs på FODMAP-holdige grønnsaker.

Kyllinglår med stekte grønnsaker (4 porsjoner)

4-8 grillede kyllinglår avhengig av størrelse

4-6 poteter

1 paprika

1 grønn squash

1-2 gulrot, 8 oliven

1 ss hakkede friske urter (f.eks. basilikum, koriander, persille, rosmarin, timian)

Slik gjør du:

1. Legg kyllinglårene i en form og stek dem midt i ovnen ved 180 °C til kyllinglårene er gjennomvarme. Beregn 15-20 minutter.

2. Skjær potetene i litt tykke skiver. Del resten av grønnsakene i passe store biter.

3. Start med potetskivene og fres dem raskt i panne. Tilsett resten av grønnsakene etterhvert og fres videre til alt er mørt. Tilsett oliven og finhakkede urter rett før servering.

Kyllingpai med spinat (4 porsjoner)

Paibunn:

150 g smør/margarin

200 g glutenfri melblanding ca. 2 ss vann

Fyll:

4 kyllingfileter i biter

200 g frisk spinat

5 egg

3 dl laktosefri melk

1 ts salt

½ ts pepper

10 sorte oliven

100 g revet hvitost, mozzarella eller smakfull ost

Slik gjør du:

1. Smuldre smør/margarin og mel, og tilsett vann til en smidig deig. La deigen hvile kaldt i ca. 1/2 time.
2. Trykk deigen ut i en paiform og prikk med en gaffel. Stek i ovn ved 200 °C i ca. 15 minutter.
3. Stek kyllingbitene. Tilsett rensed og vasket spinat og fres det til spinaten faller sammen. Fordel alt på den forstekte pai bunnen.
4. Hell over sammenvispes egg, melk, salt og pepper. Dryss delte oliven og revet ost på toppen. Stek paien videre i ca. 25 minutter til den er gyllenbrun.

TIPS: Bruk annet kjøtt enn kylling. Paistykker kan pakkes i folie og lunes over grillen.

Kylling/biffsalat med frukt og valnøtter (4 porsjoner)

1 hodesalat og evt andre grønnsaker med lite FODMAP.

3 kyllingfileter i strimler/ kjøtt i strimler i tilsvarende mengder

1 ½ ss rapsolje til steking

½ cantaloupe/honningmelon

1 boks hermetisk ananas i ringer (liten boks)

100 g blå druer

75 g valnøttkjerner, grovhakket eventuelt litt revet appelsinskall

Dressing:

175 ml laktosefri yoghurt naturell

1 ss toppet lønnesirup

Smak evt. til med sukker

Slik gjør du:

1. Skyll salaten. Ta ut de midterste bladene på salathodet, og skjær vekk roten slik at bladene løsner. Legg salaten på serveringsfat.
2. Stek kyllingstrimlene/biffstrimlene i oljen i en panne på middels varme i ca. 2-3 minutter.

3. Skjær melonkjøttet i terninger. Del ananasringene i mindre biter. Del druene i to, og ta eventuelt bort stenene.
4. Bland alle ingrediensene og legg dem i midten på salathodet. Pynt med revet appelsinskall.
5. Varm lønnesirupen til den er flytende og rør den inn i yoghurten. Smak eventuelt til med sukker.

Server dressingen i en skål ved siden av salaten.

Torskegryte med paprika og sorte oliven (4 porsjoner)

400-500 gram torskefilet, i biter

4-6 poteter, i skiver

1/4-1/2 rød chili, finhakket

2-3 ss tomatpurè

1 rød paprika, i strimler

1 boks hermetiske tomater

1/2-1 dl vann

1/2 sitron,

salt og pepper

en neve steinfrie oliven

eventuelt friske krydderurter

Tilbehør: Glutenfritt brød

Slik gjør du:

Finn frem en stekepanne med høye kanter eller en gryte. Fres chili i olivenolje og tilsett tomatpurè, rør godt sammen og la det stå og surre et par minutter. Tilsett hermetiske tomater og vann, og smak til med salt og eventuelt litt pepper. Ha i potetskiver og paprika. Dytt potetene godt nedi tomatblandingen, sett på lokk og la det trekke i ca. 20 minutter på middels varme, til potetene er knapt møre. Pass på at det ikke svir seg, så rør forsiktig eller «rist» på retten innimellom.

Når potetene er nesten ferdige dytter du fiskebitene oppi gryta/stekepannen. Pass på at fiskestykkene er omtrent like store. Da blir de også ferdige omtrent samtidig. Ha over nypresset sitronsaft og sorte oliven. Sett på lokket og la retten trekke på lav til middels varme i 5-7 minutter, til fisken er ferdig og så vidt «flaker» seg. Gi retten et dryss med grovt hakkede krydderurter, hvis du har, og server umiddelbart.

Laktosefri iskrem (6 porsjoner)

4 eggeplommer
100 g sukker
1 vaniljestang
3 dl laktosefrie kremfløte

Tilbehør: Friske bær og mørk sjokolade

Slik gjør du:

1. Pisk eggeplommer og sukker til eggedosis.
2. Splitt vaniljestangen på langs og skrap frøene over i kremfløten. Pisk kremfløten stiv og bland med eggedosis.
3. Fyll iskremblandingen i tomme yoghurtbegre eller liknende og sett i fryseren til den har stivnet. Server gjerne med friske bær og revet mørk sjokolade på toppen.

Havrekjeks med nøtter og sjokolade (ca. 40 stk.)

200 g smør/margarin
2 dl brunt sukker
2 dl hvitt sukker
1 ts vaniljesukker
2 egg
3 dl glutenfri melblanding
½ ts salt
1 ts bakepulver
6 1/2 dl glutenfri havregryn
ca. 100 g mørk sjokolade, grovhakket
ca. 80 g mandler, grovhakket

Slik gjør du:

Rør smør, sukker og vaniljesukker til det blir en porøs smørkrem. Tilsett eggene, ett om gangen, og rør godt. Bland i mel, salt og bakepulver og rør godt. Tilsett til slutt havregryn og hakkete mandler og sjokolade.

Sett kjeksene med skje på stekeplate dekket med bakepapir, og ha litt god avstand mellom kakene.

Stekes ved 150°C i ca. 15 minutter.

Ta de ferdigstekte kakene av platen med en stekespatte, og la dem avkjøles på rist før de legges i tett boks eller glass.

Attachment 11: Additional information for group B

Ved glutenfri diett unngår man glutenproteinene som finnes i hvete, rug og bygg. Disse kornsortene er også høye i FODMAPs (fruktaner) i tillegg til å være glutenholdige. Ved lav FODMAP skal man unngå fruktaner og andre FODMAPs, men dette har ingenting med gluten å gjøre.

Glutenholdige produkter kan inneholde ingredienser som er høy FODMAP. Det er derfor viktig å lese innholdsfortegnelsen før man spiser en matvare.

Ingredienser i glutenfrie produkter som er høy FODMAP:

- Inulin
- Linsemel
- Bønnemel
- Kikertmel
- Lupinmel
- Betefiber
- Eplefiber
- Eplemos
- Honning
- Oligofruktose

Glutenfrie varer som er lav FODMAP:

Brødprodukt

- **Semper:** Grovt knekkebrød, havreknekk, landknekkebrød, linfrøknekkebrød, minibaguetter
- **Fria:** Grova, Fiber, Loff
- **Hatting:** Glutenfri rundstykker, glutenfri havrerundstykker (begrenset)
- **BFree wraps**

Melblandinger

- **Semper:** Fin Mix, Grov mix
- **Toro:** Lys melblanding, kakemix, langpannekake
- **Det glutenfrie verksted:** Flere produkter

Melk: Havremelk (begrensning på 30 ml), mandelmelk, risemelk, kokosmelk, laktosefri melk (anbefales pga. kalsium og protein).

Søtt: Dronning kokesjokolade, non stop, sjokolade (pålegg), sjokolade 70%

Attachment 12: Protocol

The effect of FODMAP reduction in addition to gluten free diet in coeliac disease

Background

Coeliac disease is a common autoimmune disease, where ingestion of gluten will cause an immune reaction in predisposed individuals. The immune reaction can cause intestinal damage such as villous atrophy, crypt hyperplasia and chronic inflammation. The only treatment of coeliac disease is a lifelong gluten-free diet, and strict adherence to such a diet will lead to full mucosal healing and symptom relief in the majority of patients. However, a part of coeliac disease patients also have IBS-like symptoms in addition to their gluten intolerance, thus not responding fully to a gluten free diet. The inflammation of the mucosa seen in coeliac disease is thought to predispose for functional bowel disorders such as IBS (1). These patients will possibly benefit from a FODMAP reduced diet, as the diet has been shown to give significant symptom relief and increased quality of life in many IBS patients (2, 3).

Irritable bowel syndrome (IBS) is a functional gastrointestinal disorder, affecting 10-20% of the general population, and is characterized by altered bowel habits and abdominal discomfort. IBS can be diagnosed using the Rome III criteria (4). IBS is a diagnosis of exclusion, which means that the ruling out of other possible diseases is essential before diagnosis is set. The cause behind IBS is not fully understood yet; but several hypotheses have been proposed. Visceral hypersensitivity, gut dysmotility and disturbance in the brain-gut-axis are assumed to be of importance in its pathophysiology. The best treatment available for IBS patients per se is diet. The FODMAP diet was developed by the dietician Susan Sheperd and her research group in 1999, when they started to exclude several foods IBS patients reported as symptom triggering. FODMAP is short for fermentable oligosaccharides, disaccharides, monosaccharides and polyols, and is a grouping of carbohydrates that are inadequately absorbed in the small intestine and instead fermented by intestinal bacteria.

There are several hypotheses on why FODMAPs trigger symptoms in IBS patients, some being thought to have more significance than others. FODMAPs are thought to have an osmotic effect on the gut, and also the fermentation by gut bacteria resulting in production of gas and small chain fatty acids are thought to cause pain and discomfort in IBS patients (5).

However, the FODMAPs cannot be considered as the cause of IBS, but the diet represents a treatment alternative that can offer symptom relief for these patients.

Purpose and objectives

The purpose of the study is to investigate whether coeliac disease patients with IBS-like symptoms can have a symptomatic and a quality of life benefit from FODMAP reduction in addition to their gluten free diet. Another objective is to investigate whether a FODMAP reduced diet will have any effect on the gut microbiota or influence the degree of fermentation by gut bacteria.

H_{a1}: A FODMAP reduction in addition to a gluten free diet will give symptom relief and increased quality of life in coeliac disease patients with IBS-like symptoms.

H_{a2}: A FODMAP reduction will affect the microbiota and the degree of fermentation

Separately from the study of FODMAP reduction, we will also follow a group of newly diagnosed coeliac disease patients for 6 weeks. The objective here is to investigate whether there will be a change in the degree of fermentation and in the microbiota after 6 weeks of gluten free diet.

Design and method

The study is an open, prospective, randomised, and controlled study consisting of an intervention group and a control group, where ideally, each group will consist of approximately 20 subjects. The participants will be recruited between June and December 2015, mainly from the Norwegian Coeliac Society (NCF) and Læring- og mestringscenteret (LMS). Some may also be recruited from the polyclinic for coeliac disease at Haukeland University Hospital.

The intervention group will follow a low FODMAP diet in addition to their gluten free diet for 6 weeks, whilst the control group will follow their regular gluten free diet. The intervention group will receive dietary counselling on how to follow a low FODMAP diet, and the control group will receive additional dietary counselling on the gluten free diet. After end of study, the control group will be offered counselling on the FODMAP diet.

Inclusion criteria:

- Confirmed coeliac disease diagnosis for at least 6 months
- IBS-like symptoms confirmed by the Rome III criteria
- Score >75 on the IBS Symptom Severity Score (IBS-SSS)
- Subjects between 18 - 60 years of age

Exclusion criteria:

- Subjects with therapy-resistant coeliac disease
- Recent biopsy with abnormal findings

The group of newly diagnosed coeliac disease patients will consist of approximately 20 subjects, and will be recruited in the same time period from Læring- og mestringscenteret (LMS). The subjects included in this group will be those with a new diagnosis who is about to commence on a gluten free diet.

Variables

Variables included in the study will be the following:

Symptoms

Quality of life

Microbiota

Hydrogen breath test

Blood tests

Collection of data

Data will be collected through questionnaires, biological material and breath tests.

In order to measure symptoms we will use the standardized and validated IBS-Symptom Severity Score (IBS-SSS). This scheme includes five different questions with a score from 0-100, and offers a classification of symptom severity. We will also use the Rome III criteria to confirm IBS-like symptoms. To measure quality of life, we will use the questionnaire Short Form Survey (SF-36). This scheme includes questions regarding physical and mental health. A compliance scheme will be used in the intervention group in order to assess adherence to the diet. There will be taken serological test for coeliac disease at baseline off all participants. These will be included in the study as a possible explanatory variable. All participants will do

a 4-day prospective food diary at baseline and after the intervention.

At baseline, both groups will fill in these questionnaires regarding their symptoms and quality of life. They will be asked to fill in the same questionnaires after 3 weeks and at the end of study (at 6 weeks). The subjects in the intervention group will also fill in the compliance scheme at 3 weeks and 6 weeks of diet, and also at 10 weeks (4 weeks after end of study). The questionnaires will be filled out when the participants are present at Haukeland University Hospital for collection of data at baseline and after 6 weeks. Ideally, the questionnaires at 3 weeks will be filled out during follow-up at Haukeland University Hospital. For those who are not able to attend this follow-up, the questionnaires will be mailed.

We will perform a breath test in both the intervention group, the control group and in the group of newly diagnosed coeliac disease patients. The breath test will be performed using a “Model SC MicroLyzer”.

The principle behind the breath test is to measure the amount of hydrogen breathed out, which correlates to the production of hydrogen by the bacteria in the intestines. We will perform a 60-minute breath test, measuring breath at 0, 15, 30, 45 and 60 minutes. The breath test will be done on the basis of their diet, comparing degree of fermentation on their normal diet at baseline, after 3 weeks and after 6 weeks of diet.

The stool samples will be collected at baseline, after 3 weeks and after 6 weeks of diet in the intervention group, control group and in the group of newly diagnosed coeliac disease patients. The stool samples will be sent to a laboratory in Oslo; Genetic Analysis (GA), who will perform the microbiota analyses. The stools samples will be tested utilizing DNA sequences within the 16S rRNA gene of the bacteria in order to identify any bacterial imbalance in the microbiota. We want to investigate whether the microbiota changes based on what the participants eat.

Analyses

The data will be summarized in figures and/or tables. We will use STATA or SPSS to perform statistical analyses.

Economy

Funding

Kamilla Nuland, Ida Serine Melhus Strindmo, the main supervisor and co-supervisors will not receive any form of remuneration.

Time schedule

February – April 2015	Writing of protocol and applying to REC
June – December 2015	Recruiting of patients and performance of study
February – March 2016	Data analyses
April – May 2016	Writing of Master's Thesis

Ethics

There is no risk of harm in this study. The intervention and the data collection may be perceived as demanding for some, but it will not cause any harm to the participants. The study is voluntarily and the participants can withdraw from the study at any point without providing any justification

Reference list

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2. Halmos EP, Power VA, Shepherd SJ, Gibson PR, Muir JG. A diet low in FODMAPs reduces symptoms of irritable bowel syndrome. *Gastroenterology*. 2014;146(1):67-75.e5.
3. Gibson PR, Shepherd SJ. Evidence-based dietary management of functional gastrointestinal symptoms: The FODMAP approach. *Journal of gastroenterology and hepatology*. 2010;25(2):252-8.
4. The Rome Foundation. Rome III Diagnostic Criteria for Functional Gastrointestinal Disorders 2015 [cited 2015 01.05.2015]. Available from: <http://www.romecriteria.org/criteria/>.
5. Shepherd SJ, Lomer MC, Gibson PR. Short-chain carbohydrates and functional gastrointestinal disorders. *The American journal of gastroenterology*. 2013;108(5):707-17.

Attachment 13: Information letter

Forespørsel om deltakelse i forskningsprosjektet:

Effekt av FODMAP-reduksjon i tillegg til glutenfri kost ved cøliaki

Bakgrunn og hensikt

Det er kjent at mange pasienter med sikker cøliaki opplever begrenset eller ingen symptomlindring av glutenfri kost, tross normalisering av blodprøver og evt. tynntarmsbiopsi. Det er usikkert hvordan disse symptomene skal behandles best. Dette er derfor et spørsmål til deg om å delta i en forskningsstudie hvor vi vil sammenligne de to behandlingalternativene som finnes. Den ene gruppen vil få en grundig veiledning i strikt glutenfri kost, mens den andre vil få en såkalt FODMAP-reduisert kost. Vi vil se på tilleggs effekten av en slik diett hos personer med cøliaki og mageplager i forhold til en streng glutenfri diett.

FODMAP er en forkortelse for fermenterbare oligo-, di-, og monosakkarider og polyoler. Dette er karbohydrater som gir næring til bakterier i tarmen og som hos enkelte kan forårsake mageplager som diaré, forstoppelse, magesmerter og oppblåsthet. Matvarer som inneholder FODMAP er blant annet hvete, rug, visse melkeprodukter, løk, bønner, søtstoffer, epler, mango, brokkoli og plommer. Lav-FODMAP-diett går ut på å unngå å spise matvarer med høyt innhold av FODMAP.

Du er valgt ut til å få tilbud om å delta i studien fordi du er i alderen 18-60 år, har cøliaki og har vært på cøliakikurs. Du har spist glutenfri kost i minst seks måneder, men har likevel ubehag og mageplager. Dette oppfatter vi som symptomer på «irritabel tarm». Det finnes forskning som viser at lav-FODMAP diett kan gi symptomlindring ved irritabel tarm. Det er imidlertid ikke forsket på om dietten kan være nyttig for cøliakere med irritabel tarm, og derfor spør vi om du vil være med på denne studien som kan vise oss om FODMAP-restriksjon i tillegg til glutenfri kost gir mer effektiv symptomlindring enn innskjerpet glutenfri kost alene.

Studien er en åpen, kontrollert studie utført av to masterstudenter i klinisk ernæringsfysiologi, veiledet av overlege/professor ved Universitetet i Bergen og Haukeland Universitetssykehus og klinisk ernæringsfysiolog ved Haukeland Universitetssykehus, som er ansvarlige for prosjektet.

Hva innebærer studien?

Studien innebærer at du over en periode på seks uker enten spiser en strikt glutenfri kost (gruppe A) eller at du spiser en spesiell kost som inneholder lite FODMAP i tillegg til strikt glutenfri kost (gruppe B). Det vil være tilfeldig om du havner i gruppe A eller gruppe B. En lav FODMAP-kost betyr at du må kutte ut ulike typer matvarer. Havner du i gruppe B, vil du senere få en detaljert oversikt over matvarer du ikke kan spise, og en liste med alternativer til de matvarene du må kutte ut. Dersom du velger å delta i studien, vil du bli invitert til et møte der du får utdypende forklaring om hva som skal skje i studien. Dersom du havner i gruppe A vil du også få mer informasjon om glutenfri kost, men dersom du havner i gruppe B vil du få mer informasjon om lav-FODMAP-dietten. Du skal møte opp på Haukeland Universitetssykehus tre ganger for å ta blodprøver og pustepøver og for samtaler med studentene i klinisk ernæringsfysiologi. Du skal også avgi avføringsprøver, fylle ut noen

spørreskjemaer og fylle ut en kostdagbok over 4 dager. Dette gjøres før oppstart av studien, etter 3 uker og etter 6 uker, og i tillegg skal noen skjemaer fylles ut 4 uker etter avsluttet studie. Dette kan gjøres hjemme og deretter sendes i posten.

Mulige fordeler

Fordelen ved å delta er en mulig bedring av symptomene, dette er imidlertid usikkert. Det betyr mulig mindre diaré, mindre forstoppelse, mindre magesmerter og/eller mindre oppblåsthet. En bedring av symptomer fra tarmen vil ofte også medføre en bedring i livskvalitet.

Mulige ulemper

Det er usannsynlig at studien kan medføre bivirkninger eller ubehag. Det er mulig at du ikke får noen bedring av dietten. Utover dette er det ingen risiko forbundet med studien. Du må møte opp på Haukeland Universitetssykehus tre ganger, noe som kan oppleves som belastende og/eller tidskrevende for enkelte. Du må også ta to avføringsprøver, blodprøver og to pustep prøver. Dietten du skal følge fører også til at du sannsynligvis må kutte ut en del matvarer som du vanligvis spiser, noe som kan oppleves som vanskelig for noen. Det kan også være en utfordring å gå på diett i sosiale sammenhenger.

Hva skjer med prøvene og informasjonen om deg?

Avføringsprøvene, blodprøvene og pustep prøvene som er tatt av deg, og informasjonen som registreres om deg, skal kun brukes slik som beskrevet i hensikten med studien. Alle opplysninger og prøver vil bli behandlet uten navn og fødselsnummer eller andre direkte gjenkjennende opplysninger. En kode knytter deg til dine opplysninger og prøver gjennom en navneliste. Det betyr at opplysningene er avidentifiserte. Det er kun autorisert personell knyttet til prosjektet som har adgang til navnelisten og som kan finne tilbake til deg. Avføringsprøvene og blodprøvene vil destrueres etter at nødvendige analyser er tatt. Ved publisering av resultatene vil identiteten din ikke komme fram.

Frivillig deltakelse

Det er frivillig å delta i studien. Du kan når som helst, uten å oppgi noen grunn, trekke ditt samtykke til å delta i studien. Dette vil ikke få noen konsekvenser for din videre behandling. Dersom du ønsker å delta, undertegner du samtykkeerklæringen på siste side av dette skrivet. Om du nå sier ja til å delta, kan du senere trekke tilbake ditt samtykke uten at det påvirker din øvrige behandling. Dersom du senere ønsker å trekke deg eller har spørsmål til studien, kan du kontakte studentene i klinisk ernæringsfysiologi Ida Serine M. Strindmo (Telefon: 900 31 585, e-post: ist104@student.uib.no) og/eller Kamilla Nuland (Telefon: 988 45 679, e-post: knu030@student.uib.no). Eventuelt kan ansvarlig lege Jan Gunnar Hatlebakk kontaktes på telefonnummer 977 07 817 eller på e-post: jan.hatlebakk@helse-bergen.no.

Ytterligere informasjon om studien finnes i kapittel A – utdypende forklaring av hva studien innebærer.

Ytterligere informasjon om biobank, personvern og forsikring finnes i kapittel B – Personvern, biobank, økonomi og forsikring.

Samtykkeerklæring følger etter kapittel B.

Kapittel A- utdypende forklaring av hva studien innebærer

Kriterier for deltakelse

Du er valgt ut til å forespørres til å delta i studien fordi du er i alderen 18-60 år, har cøliaki, har vært på cøliakikurs, gått på glutenfri kost, men har allikevel ubehag og symptomer etter seks måneder. I tillegg har du scoret 75 eller mer på spørreskjemaet IBS-SSS og scoret på Roma III-kriteriene for IBS, og har dermed symptomer på «irritabel tarm».

Bakgrunnsinformasjon om studien

Ikke alle med en sikker cøliakidiagnose blir symptomfrie på glutenfri kost, på tross av at antistoffer i blodprøver og eventuelt tyntarmsbiopsier er normaliserte. Det er kjent at personer med cøliaki har en overhyppighet av irritabelt tarm syndrom (IBS). Cøliakere med IBS kan tenkes å ha en positiv effekt av FODMAP-reduisert kosthold, men dette er ikke undersøkt tidligere, og det er derfor nyttig å kartlegge. Kan FODMAP-restriksjon gi symptomlindring hos cøliakipasienter som ikke har tilfredsstillende effekt av bare glutenfri kost?

Matvarer som inneholder mye FODMAPs (fermenterbare oligo-, di-, og monosakkarider og polyoler) kan gi plager fra mage- tarm området, særlig hos de med irritabel tarm. Mat som inneholder FODMAP blir fermentert i tykktarmen. Det betyr at bakterier i tykktarmen omdanner ufordøyd mat til gass og til energi (korte fettsyrer). Dette er en normal og viktig prosess, og det er blant annet essensielt for tarmcellenes helse. Fermentering er noe som i ulik grad skjer hos alle mennesker, men de med irritabel tarm får antageligvis mer plager av dette enn friske.

Ved irritabel tarm skjer det en unormal respons i mage- tarm kanalen som kan skyldes overfølsomhet i tarmen. Det kan også skyldes en unormal respons fra nervesystemet i tarmen, en forstyrrelse i bakteriefloraen, motilitetsforstyrrelse (unormal bevegelse av tarminnholdet) eller smerter på grunn av gassdannelse fordi det blir en utvidelse av tarmen. Dette kan gi de typiske symptomene på irritabel tarm, som oppblåsthet, magesmerter, gassdannelse, diaré og/eller forstoppelse. Tanken ved lav-FODMAP diett er å redusere inntak av mat som kan fermenteres av bakterier slik at det blir mindre fermentering i tarmen, og dermed mindre plager.

Blodprøver, avføringsprøver og pustep prøver

Før oppstart av studien skal du ta en blodprøve for å sjekke betennelsesmarkører. Blodprøven tas på sykehuset i forbindelse med gruppemøtet før oppstart av selve dietten. Du skal også avgi en avføringsprøve som skal analyseres for å studere bakteriesammensetningen. Avføringsprøven kan tas hjemme og sendes i posten i en spesial-emballasje. Pustep prøver vil bli gjort på sykehuset før oppstart av studien for å se på grad av fermentering av bakteriene i tykktarmen. Du vil bli tildelt time for dette og undersøkelsen tar ca. 60 minutter. Blod-, avførings- og pustep prøver vil bli gjentatt etter seks uker.

Spørreskjemaer og kostregistrering

Du skal svare på fire spørreskjemaer før oppstart av studien, etter tre uker og etter seks uker. Disse skjemaene er Rome III (kriterier for irritabel tarm), IBS-SSS (symptomer på irritabel tarm), SF-36 (livskvalitet) og compliance (overholdelse av FODMAP-dietten). I tillegg skal du utføre en 4-dagers kostregistrering på de samme tidspunktene.

Tidsskjema – hva skjer og når skjer det?

Du har blitt kontaktet og blitt forespurt om å delta i studien. Dersom du er villig til å være med i studien, signerer du samtykkeskjemaet bakerst i dette skrevet.

Du skal deretter møte opp på tre møter, som alle vil finne sted på Haukeland sykehus på dagtid så langt det lar seg gjøre.

Du vil bli invitert til et gruppemøte med opptil 1-3 andre deltakere. Avhengig om du er havnet i gruppe A eller gruppe B vil studentene i klinisk ernæringsfysiologi der gi grundig informasjon om strikt glutenfri kost (gruppe A) eller lav-FODMAP-dietten (gruppe B) og hva som skal skje fremover. Du skal også ta en blodprøve og en pusteprøve, før eller etter dette møtet. Dette gjøres også på Haukeland Universitetssykehus og pusteprøven tar ca. 60 minutter, hvor du puster inn i et rør hvert 15.minutt. Litt ventetid før og etter må beregnes. Disse kan gi nyttig informasjon som kan hjelpe deg til å minske IBS-symptomene.

Du vil også få utdelt skriftlig informasjon. Spørreskjemaer om hvor plaget du er av irritabel tarm og hvordan det påvirker din livskvalitet skal fylles ut og leveres en av studentene før eller etter møtet. Du skal også gjøre en 4 dagers prospektiv kostregistrering der du noterer ned alt du spiser. Etter at du har registrert kosten din i 4 dager, sender du registreringen så fort som mulig i posten til postadresse:

Medisinsk avdeling
Haukeland universitetssjukehus
5021 Bergen

Du skal også avgi en avføringsprøve som du kan levere før eller etter møtet, eller som kan tas hjemme og sendes til adressen ovenfor. Dersom du er havnet i gruppe B, får du også med deg et compliance-skjema som skal fylles ut etter tre uker og tas med neste gang.

Andre møte blir tre uker etter oppstart av studien, altså etter at du har gått på den strikte glutenfrie dietten i tre uker dersom du havnet i gruppe A, eller etter at du har gått på lav FODMAP-diett i tillegg til glutenfri diett i tre uker (gruppe B). Der vil eventuelle spørsmål og problemer diskuteres. I forkant av dette møtet skal du på ny ha fylt ut spørreskjemaene og ta disse med på møtet. Dersom du havnet i gruppe B som går på FODMAP-redusert kost i tillegg til glutenfri kost, skal du også ha med deg et ferdig utfylt compliance-skjema som går på overholdelse av dietten etter tre uker.

Tredje og siste møte blir så når studien er avsluttet, etter at du skal ha gått på dietten i seks uker. Dette er også et møte med 1-3 andre deltakere. Eventuelle problemer og spørsmål kan tas opp. Du har også mulighet til å kontakte studentene på telefon eller e-post (se kontaktinformasjon på andre side) hvis det oppstår problemer underveis. Du kan eventuelt også ringe den ansvarlige legen. Dersom du er i gruppe A, vil du på dette møtet få informasjon om FODMAP-dietten. Dersom du er i gruppe B, vil du på dette møtet få informasjon om gradvis reintroduksjon av FODMAPs. Igjen tar du med ferdig utfylte spørreskjemaer i tillegg til 4 dagers kostregistrering. Også i forkant eller etterkant av dette møtet skal du ta pusteprøve og blodprøve, og du skal også ta med deg en avføringsprøve.

Én måned etter at du har fullført dietten skal du sende inn/levere det siste spørreskjemaet til oss.

Alternative prosedyrer dersom du velger å ikke delta i studien:

Dersom du ikke ønsker å delta i studien vil det ikke få noen konsekvenser for din videre behandling. Dersom du underveis i studien ønsker å trekke deg kan du ta kontakt når som helst. Da vil du bli invitert til en samtale, og eventuelle problemer vil bli diskutert. Du har selvfølgelig fortsatt rett til å slutte i studien når som helst uten å oppgi grunn. Dersom du ønsker å slutte med dietten, så vil du få tilbud om å få andre generelle råd for hva du kan gjøre for å lindre symptomene.

Studiedeltakerens ansvar:

Som deltaker i denne studien ber vi om at du setter deg inn i informasjonen og følger diettene så godt som mulig. Tid og dato for møtene, pusteprovne, blodprøvene og avføringsprøvene (skal gjøres samme dag) skal avtales slik at det passer for begge parter. Med tanke på at det vil være 1-4 deltakere på hvert møte i tillegg til to mastergradsstudenter i klinisk ernæringsfysiologi, ber vi om at du er fleksibel på tid og dato for møtene og prøvetakningene. Du må også møte opp til avtalt tid, eller eventuelt ringe i god tid hvis timen ikke passer. Du har også ansvar for å fylle ut skjemaene som avtalt, ta dem med på møtene og sende de i posten før avtalt frist. På det første møtet med studentene vil du få mer nøyaktig informasjon enn det som står i dette skrivet.

Endringer i planen:

Dersom det skjer en endring i planen, eller en tidligere avslutning av dietten, vil du bli informert så raskt som mulig. Du vil også bli orientert dersom ny informasjon blir tilgjengelig som kan føre til at du ikke lenger vil delta i studien. Dersom det oppstår en uforutsett hendelse som gjør at studien må avsluttes vil du bli kontaktet snarest mulig.

Utgifter

Du vil få kompensasjon for reiseutgiftene til og fra Haukeland Universitetssykehus. Du får ikke kompensasjon for eventuell tapt arbeidstid, godtgjørelse for deltakelse eller tilskudd til diett.

Kapittel B - Personvern, biobank, økonomi og forsikring

Personvern

Opplysninger som registreres om deg er informasjon om symptomer og livskvalitet fra forskjellige skjemaer. Resultater fra blodprøver, pusteprovver og avføringsprøver vil også bli registrert, men selve prøvene vil bli destruert etter at analysene er gjort. Kontaktinformasjon (navn og telefonnummer) om deg vil bli lagret. Det er kun vi som holder på med studien som har tilgang til opplysninger om deg, og de vil bli lagret innelåst i et skap på studieleders kontor.

Biobank

Avføringsprøver og blodprøver kastes etter analyse, det vil si at det ikke opprettes en biobank.

Utlevering av materiale og opplysninger til andre

Hvis du sier ja til å delta i studien, gir du også ditt samtykke til at prøver og aidentifiserte opplysninger kun brukes til denne studien ved Haukeland Universitetssykehus i Bergen. Aidentifiserte opplysninger skal ikke sendes til andre foretak eller foretak i andre land.

Retten til innsyn og sletting av opplysninger om deg og sletting av prøver

Hvis du sier ja til å delta i studien, har du rett til å få innsyn i hvilke opplysninger som er registrert om

deg. Du har videre rett til å få korrigert eventuelle feil i de opplysningene vi har registrert. Dersom du trekker deg fra studien, kan du kreve å få slettet innsamlede prøver og opplysninger, med mindre opplysningene allerede er inngått i analyser eller brukt i vitenskapelige publikasjoner.

Økonomi og Haukeland Universitetssykehus' rolle

Studien er finansiert gjennom forskningsmidler fra Medisinsk avdeling og ved Klinisk Institutt 1 ved Universitetet i Bergen. De vil bidra med personell til analyser av blodprøver. Firmaet Genetic Analysis i Oslo vil analysere avføringsprøvene. Det er ingen mulige interessekonflikter.

Forsikring

Forsikringsordningen som gjelder er Norsk Pasientskadeerstatning, idet du som deltaker er under behandling ved Haukeland Universitetssykehus.

Informasjon om utfallet av studien

Du har som deltaker i studien rett til å få informasjon om utfallet av studien når dette er klart. Det vil mest sannsynlig bli våren 2016.

Samtykke til deltakelse i studien

Jeg er villig til å delta i studien

(Signert av prosjektdeltaker, dato)

Jeg bekrefter å ha gitt informasjon om studien

(Signert, rolle i studien, dato)

Attachment 14: Information from REK



Region: REK sør-øst	Saksbehandler: Hege Holde Andersson	Telefon: 22845514	Vår dato: 01.07.2015	Vår referanse: 2015/915 REK sør-øst B
			Deres dato: 12.05.2015	Deres referanse:

Vår referanse må oppgis ved alle henvendelser

Jan Hatlebakk
Helse Bergen HF

2015/915 Effekt av FODMAP-reduksjon som tillegg til glutenfri kost ved coeliaki

Forskningsansvarlig: Helse Bergen HF

Prosjektleder: Jan Hatlebakk

Vi viser til søknad om forhåndsgodkjenning av ovennevnte forskningsprosjekt. Søknaden ble behandlet av Regional komité for medisinsk og helsefaglig forskningsetikk (REK sør-øst) i møtet 08.06.2015. Vurderingen er gjort med hjemmel i helseforskningsloven (hfl.) § 10, jf. forskningsetikkloven § 4.

Prosjektleders prosjektbeskrivelse

«Ca.30% av pasienter med coeliaki blir på ikke fri for symptomer som smerter, oppblåsthet og endret avføringsmønster. Dette ligner sykdommen irritabel tarm og vi vil se om de har nytte av kost som er redusert i innhold av kullhydrater som fermenteres i tykktarm. Pasienter som har diagnosen coeliaki og som oppfyller kriteriene for irritabel tarm, vil bli randomisert til enten: (1) kost redusert i slike karbohydrater, eller (2) kvalitetssikret glutenfri kost. Begge grupper blir veiledet av masterstudenter i klinisk ernæring. Pas fyller i kostliste i 4 dager før og under diett, tar blodprøver for coeliakistatus, leverer avføringsprøver og deltar i pustep prøver for å måle nivå av fermentering i tarmen. Diett følges i 6 uker og symptomer og livskvalitet sammenlignes i spørreskjemaer. En gruppe av nydiagnostiserte coeliakipasienter vil bli bedt om å delta med kostliste, pustep prøve og avføringsprøve før og etter 6 uker på standard glutenfri kost, for å se om fermentering endres.»

Komiteens vurdering

Komiteen har ingen forskningsetiske innvendinger til at prosjektet gjennomføres.

Under punkt **5.7 Håndtering av data etter prosjektslutt** i søknadskjema skriver prosjektleder at data skal slettes etter prosjektslutt. Komiteen gjør oppmerksom på at aidentifiserte opplysninger skal som hovedregel lagres i 5 år etter prosjektslutt av dokumentasjonshensyn, og skal deretter slettes eller anonymiseres.

Biobank

I søknadskjema står det at det biologiske materialet skal oppbevares i en tidligere godkjent generell forskningsbiobank; *Forskningsbiobank for mage-tarmsykdommer*. I informasjonsskrivet til deltagerne står det imidlertid at; *Avføringsprøver og blodprøver kastes etter analyse, det vil si at det ikke opprettes en biobank*. Sekretariatet i REK-sør øst har vært i kontakt med prosjektleder for å oppklare hvordan materialet skal oppbevares. I e-post til sekretariatet 19.06.2015 skriver prosjektleder at *Prøvene skal samles gjennom prosjektperioden for så å bli analysert samlet i februar 2016*. Siden

det humant biologiske materialet skal oppbevares i mer enn 2 måneder er det behov en spesifikk forskningsbiobank i prosjektet. Komiteen oppretter derfor en spesifikk forskningsbiobank «*Effekt av FODMAP-reduksjon som tillegg til glutenfri kost ved coeliaki.*» Ansvarshavende er Jan Hatlebakk. Biobanken planlegges å vare til 24.06.2016.

Komiteen ber om at informasjonsskriv og samtykkeerklæring revideres slik at det fremkommer at det humant biologiske materielt skal oppbevares i en forskningsbiobank. Det reviderte skrivet må sendes komiteen til orientering.

Ut fra dette setter komiteen følgende vilkår for prosjektet:

1. Informasjonsskrivet revideres i tråd med det ovennevnte og sendes komiteen til orientering.

Vedtak

Komiteen godkjenner prosjektet i henhold til helseforskningsloven § 9 og § 33 under forutsetning av at ovennevnte vilkår oppfylles.

I tillegg til ovennevnte vilkår, er godkjenningen gitt under forutsetning av at prosjektet gjennomføres slik det er beskrevet i søknaden.

Tillatelsen gjelder til 24.06.2016. Av dokumentasjonshensyn skal opplysningene likevel bevares inntil 24.06.2021. Opplysningene skal lagres aidentifisert, dvs. atskilt i en nøkkel- og en opplysningsfil. Opplysningene skal deretter slettes eller anonymiseres, senest innen et halvt år fra denne dato.

Komiteen godkjenner også oppførelsen av en spesifikk forskningsbiobank som beskrevet i søknaden.

Biobankregisteret blir underrettet ved kopi av dette brev.

Hvis forskningsbiobanken opphører, nedlegges eller overtas av andre, skal det søkes REK om tillatelse, jf. helseforskningsloven § 30.

Forskningsprosjektets data skal oppbevares forsvarlig, se personopplysningsforskriften kapittel 2, og Helsedirektoratets veileder ”*Personvern og informasjonssikkerhet i forskningsprosjekter innenfor helse- og omsorgssektoren*”

Sluttmelding og søknad om prosjektendring

Dersom det skal gjøres endringer i prosjektet i forhold til de opplysninger som er gitt i søknaden, må prosjektleder sende endringsmelding til REK. Prosjektet skal sende sluttmelding på eget skjema, se helseforskningsloven § 12, senest et halvt år etter prosjektslutt.

Klageadgang

Du kan klage på komiteens vedtak, jf. forvaltningslovens § 28 flg. Klagen sendes til REK sør-øst B. Klagefristen er tre uker fra du mottar dette brevet. Dersom vedtaket opprettholdes av REK sør-øst B, sendes klagen videre til Den nasjonale forskningsetiske komité for medisin og helsefag for endelig vurdering.

Komiteens avgjørelse var enstemmig.

Med vennlig hilsen

Geir Olav Hjortland

nestleder REK sør-øst B

Hege Holde Andersson
komitésekretær

Kopi til:

-Avdelingsdirektør Lars Birger Nesje, Helse Bergen HF

-Helse Bergen HF - Haukeland universitetssjukehus ved øverste administrative ledelse

Besøksadresse:
Gullhaugveien 1-3, 0484 Oslo

Telefon: 22845511
E-post: post@helseforskning.etikkom.no
Web: <http://helseforskning.etikkom.no/>

All post og e-post som inngår i saksbehandlingen, bes adressert til REK sør-øst og ikke til enkelte personer

Kindly address all mail and e-mailsto the Regional Ethics Committee, REK sør-øst, not to individual staff

Attachment 15: Announcement

Har du cøliaki, spiser glutenfri kost, men har likevel mye mageplager?

Vi søker voksne i alderen 18-60 år med sikker cøliaki og som har spist glutenfri kost i minst seks måneder og likevel har ubehag og mageplager. Det er usikkert hvordan disse symptomene skal behandles best.

Vi vil sammenligne de to behandlingalternativene som finnes. Den ene gruppen vil få grundig veiledning i strengt glutenfri kost, mens den andre vil bli bedt om å redusere sitt inntak av visse typer karbohydrater (FODMAP).

Deltakelse innebærer:

- Undervisning ved studenter i klinisk ernæringsfysiologi
- Blodprøver, pustep prøver og avføringsprøver
- Utfylling av spørreskjemaer
- Fylle ut kostdagbok over 4 dager i to perioder
- Tre fremmøter ved Haukeland Universitetssykehus

Godkjenning

Studien er godkjent hos Regional forskningsetisk komité. Prosjektleder og medisinsk ansvarlig er Jan Gunnar Hatlebakk, professor ved klinisk institutt 1, Universitetet i Bergen, og overlege, Haukeland Universitetssykehus.

Kontakt

Ønsker du mer informasjon og er interessert i å delta, kan du kontakte en av oss:

Ida S. M. Strindmo, student i klinisk ernæringsfysiologi

E-post: ist104@student.uib.no

Telefon: 900 31 585

Kamilla Nuland, student i klinisk ernæringsfysiologi

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Attachment 16: Abstract sent to the ESPEN conference in Copenhagen 2016

ESPEN 2016 Abstract Submission

Topic: Liver and gastrointestinal tract

Abstract Submission Identifier: ESPEN16-ABS-1484

FODMAP RESTRICTION OF A GLUTEN FREE DIET IN PATIENTS WITH COELIAC DISEASE: A RANDOMIZED, CONTROLLED CLINICAL STUDY.

Kamilla Nuland¹, Ida Strindmo¹, Gudrun Elise Kahrs², Jan Gunnar Hatlebakk³

¹Department of clinical medicine, University of Bergen, ²Department of Occupational Medicine, and Sections of Clinical Nutrition, Department of Medicine, ³Section of Gastroenterology, Department of Medicine, Haukeland University Hospital, Bergen, Norway

If you think another topic than the one selected at first would suit your abstract, please choose below.: Nutrition and chronic diseases

Presentation Method: Oral or Poster presentation

Please indicate your professional occupation: Dietitian

The presenting author fulfills the above conditions and wants to apply for a travel award: Yes

I confirm that the presenting author is under the age of 35: Yes

Rationale: 20-30 % of the coeliac patients treated with a gluten free diet have symptoms resembling irritable bowel syndrome (IBS). We wanted to investigate the benefit from restricting the content of fermentable oligo-, di-, monosaccharides and polyols (FODMAPs) in the diet.

Methods: 40 patients with coeliac disease and IBS symptoms confirmed by the Rome III-criteria and IBS-SSS (Symptom Severity Scale) were randomized and instructed by dietitians: Group A excluded all wheat starch and "traces of gluten" from the diet, and group B excluded FODMAPs as well as gluten. Symptoms were recorded at baseline, 3 and 6 weeks, and quality of life (SF-36) and 4 days prospective dietary intake records at baseline and 6 weeks, compliance and satisfaction after 6 weeks, and 1 month later. Dietist Net Free was used for FODMAP calculation. Statistics: T-tests and nonparametric tests.

Results: 20 patients were included in each group; A (18F/2M, age 39±15) and B (15F/5M, age 43±12). 42.5% had constipation, 27.5% diarrhoea and 30% both. The mean total IBS-SSS score was significantly reduced: Group A from 260 to 204 (p=0.0022), group B from 263 to 145 (p<0.0001), p=0.0247, group B vs. A. In group A 10% reached remission, in group B 25% (p=0.408). All subscales improved significantly in group B, but only abdominal pain severity in group A. SF-36 physical health score improved in group B (p= 0.0081), but not in group A. Patients in group B were significantly more satisfied with pain relief (p=0.0132), but felt it was more challenging to follow the diet (p=0.0008).

Conclusion: Patients with coeliac disease and IBS-symptoms had significant improvement in abdominal symptoms and physical health from a low FODMAP gluten free diet for 6 weeks. The diet was more effective than a strict gluten free diet, and should be offered to coeliac patients with IBS-symptoms.

Disclosure of Interest: None Declared

Keywords: coeliac disease, low FODMAP diet

Attachment 17: Abstract sent to United European Gastroenterology Week in Vienna

FODMAP RESTRICTION OF A GLUTEN FREE DIET IN PATIENTS WITH COELIAC DISEASE: A RANDOMIZED, CONTROLLED CLINICAL STUDY

K. Nuland¹, I. Strindmo¹, G. E. Kahrs^{2,3} and J.G. Hatlebakk⁴

¹Department of Clinical Medicine, University of Bergen, ²Department of Occupational Medicine, and Sections of ³Clinical Nutrition and ⁴Gastroenterology, Department of Medicine, Haukeland University Hospital, Bergen, Norway³.

INTRODUCTION: 20-30 % of coeliac patients on a gluten free diet still have irritable bowel syndrome (IBS) symptoms. A low FODMAP (fermentable oligo-, di-, monosaccharides and polyols) diet is effective to reduce symptoms in IBS patients.

AIM&METHOD: We wanted to investigate the benefit from restricting the FODMAP content of the diet. 40 patients with coeliac disease and IBS symptoms confirmed by the Rome III criteria and IBS-SSS (Symptom Severity Scale) were randomized and instructed by dieticians: Group A excluded all wheat starch and “traces of gluten” from their diet, Group B excluded FODMAPs as well as gluten. Symptoms on IBS-SSS were recorded at baseline, 3 and 6 weeks, as well as quality of life (SF-36). Four days prospective dietary intake records at baseline and 6 weeks, compliance and satisfaction after 6 weeks, and 1 month later. Dietist Net Free was used for FODMAP calculations. Statistics: T-tests, nonparametric tests.

RESULTS: 20 patients were included in each group; A (18F/2M, age 39±15) and B (15F/5M, age 43±12). 42.5% had constipation, 27.5% diarrhoea and 30% both. The mean total IBS-SSS score was significantly reduced: Group A from 260 to 204 (p=0.0022), group B from 263 to 145 (p<0.0001), p=0.0247, group B vs. A. In group A 10% reached remission, in Group B 25% (p=0.408). All subscales improved significantly in group B, but only abdominal pain severity in group A. SF-36 physical health score improved in group B (p= 0.0081), but not in group A. Patients in group B were significantly more satisfied with pain relief (p=0.0132), but it was also more challenging to follow their diet (p=0.0008).

CONCLUSION: Patients with coeliac disease and IBS-symptoms had significant improvement in abdominal symptoms and physical health from a low FODMAP diet for 6 weeks. A gluten free diet with reduced FODMAP content was more effective than a more strict gluten free diet, and should be offered to coeliac patients with refractory IBS-symptoms on a gluten free diet.

Conflict of interest: None.