



October 12 – 15
ueg.eu/week

Introduction

According to literature data, the occurrence of hepatic steatosis is more common in patients with celiac disease than in the general population. The reasons behind this include malabsorption, proinflammatory processes, as well as weight gain and unfavourable metabolic changes on a gluten-free diet. In our prospective multicenter, case-control study (ARCTIC study) (Figure 1), we examined the occurrence of hepatic steatosis determined by ultrasound (US), body composition parameters, and blood lipid levels in patients with celiac disease who had been on a gluten-free diet for at least 1 year. We investigated the proportion of celiac patients with and without steatosis, and compared the data of celiac patients with and without steatosis.

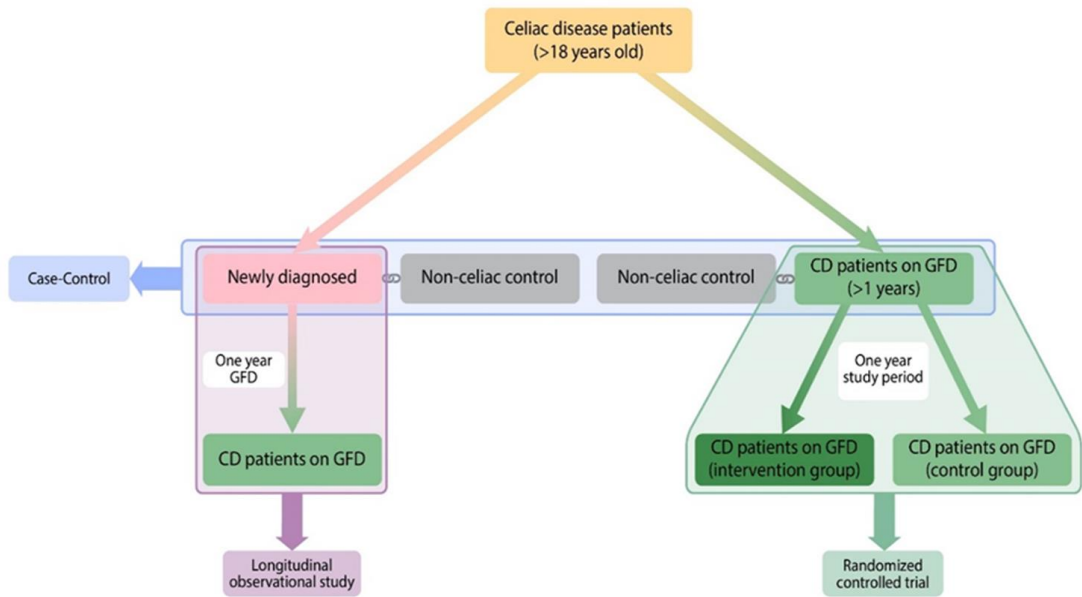


Figure 1. Design of the ARCTIC study

Methodology

Patients from three university centers with celiac disease participated in the study. Body composition analysis was performed using an InBody 770 device, measuring parameters such as BMI, waist-hip ratio, Inbody score, skeletal muscle mass (SMM), percent body fat (PBF), and visceral fat area (VFA). Blood lipids including total cholesterol, LDL, and triglyceride levels were measured. Hepatic steatosis was assessed by US using the Hamaguchi score and the NAFLD-LFS score. If either score was positive, the patient was classified into the steatosis group. Fischer’s exact test was used for categorical variables, and Welch Two Sample t-test was used to assess continuous variables. A *p*-value less than 0.05 was considered statistically significant.

Results

97 patients with celiac disease and 47 control individuals were included. Hepatic steatosis was described in 13.8% of control subjects and 35% of celiac patients (*p*=0.012). In celiac patients, steatosis developed in 31% with normal BMI. The occurrence of hepatic steatosis in celiac patients showed a significant association with BMI (*p*<0.001), waist circumference (*p*<0.001), hip circumference (*p*<0.001), PBF (*p*=0.037), VFA (*p*=0.006), and triglyceride levels (*p*=0.006). However, there was no significant difference in waist-hip ratio (*p*=0.56), SMM (*p*=0.164), InBody score (*p*=0.31), LDL (*p*=0.80), and total cholesterol level (*p*=0.73).

The adherence to a gluten-free diet did not influence hepatic steatosis (*p*=0.60). Among celiac disease patients with hepatic steatosis, 83% met the Metabolic Dysfunction–Associated Liver Disease (MASLD) criteria (vs control patients 60%). Overweight or obesity (BMI over 25) were detected in 30% of patients (vs control patients 19%). 62% of celiac patients had at least 1 cardiovascular risk factor (obesity, hypertension, carbohydrate metabolism disorder, dyslipidemia) most of which were detected by the study. (Table 1,2)

Parameters	Celiac patients (n=97) mean (range)	Control group (n=47) mean (range)	<i>p</i> -value
Female/male ratio	4.1	6.6	0.492
Age (years)	36.24 (18-76)	32.55 (18-55)	0.091
Waist-hip ratio (cm)	0.83 (0.66-1.15)	0.82 (0.65-1.27)	0.380
Skeletal muscle mass (kg)	27.28 (15.1-48.1)	25.82 (18-41.3)	0.167
Percent body fat (%)	27.5 (8.3-48.9)	26.9 (9.4-52.6)	0.729
Visceral fat area (cm ³)	88.9 (18-218.7)	81.5 (21.7-256.4)	0.393
InBody score (points)	72.8 (57-92)	73.5 (45-92)	0.624
LDL-cholesterol (mmol/l)	2.77 (1.07-4.7)	2.96 (1.68-4.56)	0.171
Total cholesterol (mmol/l)	4.65 (2.8-7.5)	4.98 (3.4-7.2)	0.043*
Triglycerides (mmol/l)	0.99 (0.3-4.29)	0.98 (0.38-2.62)	0.856
BMI (kg/m ²)	24.12 (14.8-44)	23.27 (17.6-41.2)	0.319
CRP (mmol/l)	2.98 (0.2-36.5)	2.16 (0.2-9.7)	0.156
Occurrence of steatosis (%)	36.08	13.80	0.012*

Table 1. Comparison of parameters in celiac patients and control patients

Parameters	Celiac patients without steatosis (n=62) mean (range)	Celiac patients with steatosis (n=35) mean (range)	<i>p</i> -value
Female/male ratio	5.25	2.86	0.253
Adequate diet adherence (%)	87	86	0.601
tTG positivity (%)	13	11	0.999
Waist circumference (cm)	76.2 (50-109)	88 (62-122)	<0.001*
Hip circumference (cm)	91.29 (72-116)	104.34 (85-136)	<0.001*
Skeletal muscle mass (kg)	26.5 (15.1-48.1)	28.67 (18.7-46.7)	0.164
Percent body fat (%)	25.92 (8.3-47.7)	30.29 (9.7-48.9)	0.037*
Visceral fat area (cm ³)	77.47 (19.7-197.2)	109.15 (18-218.7)	0.006*
InBody score (points)	73.5 (58-91)	71.8 (57-92)	0.316
LDL-cholesterol (mmol/l)	2.78 (1.07-4.7)	2.74 (1.32-4.3)	0.806
Total cholesterol (mmol/l)	4.67 (2.8-7.5)	4.6 (3.1-6.0)	0.733
Triglycerides (mmol/l)	0.84 (0.3-2.62)	1.27 (0.41-4.29)	0.006*
BMI (kg/m ²)	22.06 (14.8-34.3)	27.75 (17-44)	<0.001*
CRP (mg/l)	2.98 (0.2-36.5)	2.99 (0.6-6.7)	0.969

Table 2. Comparison of parameters in celiac patients with or without steatosis

Summary and Conclusions

The occurrence of hepatic steatosis is substantial in celiac patients on a gluten-free diet, even in those with normal BMI. Increased attention should be paid to its examination and monitoring during care, weight control, dietary and lifestyle counselling, as well as timely recognition and prevention of cardiovascular and metabolic diseases.