

## Introduction

Celiac disease, also sometimes referred to as gluten-sensitive enteropathy, is an immune-mediated inflammatory disease affecting the small intestine and is caused by dietary gluten and other related protein sensitivity in individuals who are genetically predisposed. There have been several small studies suggesting an increased prevalence of non-alcoholic fatty liver disease (NAFLD) in patients with celiac disease. However, large population-based studies are lacking. Further, it is unclear if the increased prevalence is secondary to celiac disease itself or due to some other associated factor(s). Hence, we decided to conduct a cross-sectional population-based study to identify the prevalence of NAFLD in patients with celiac disease and assess its risk factors.

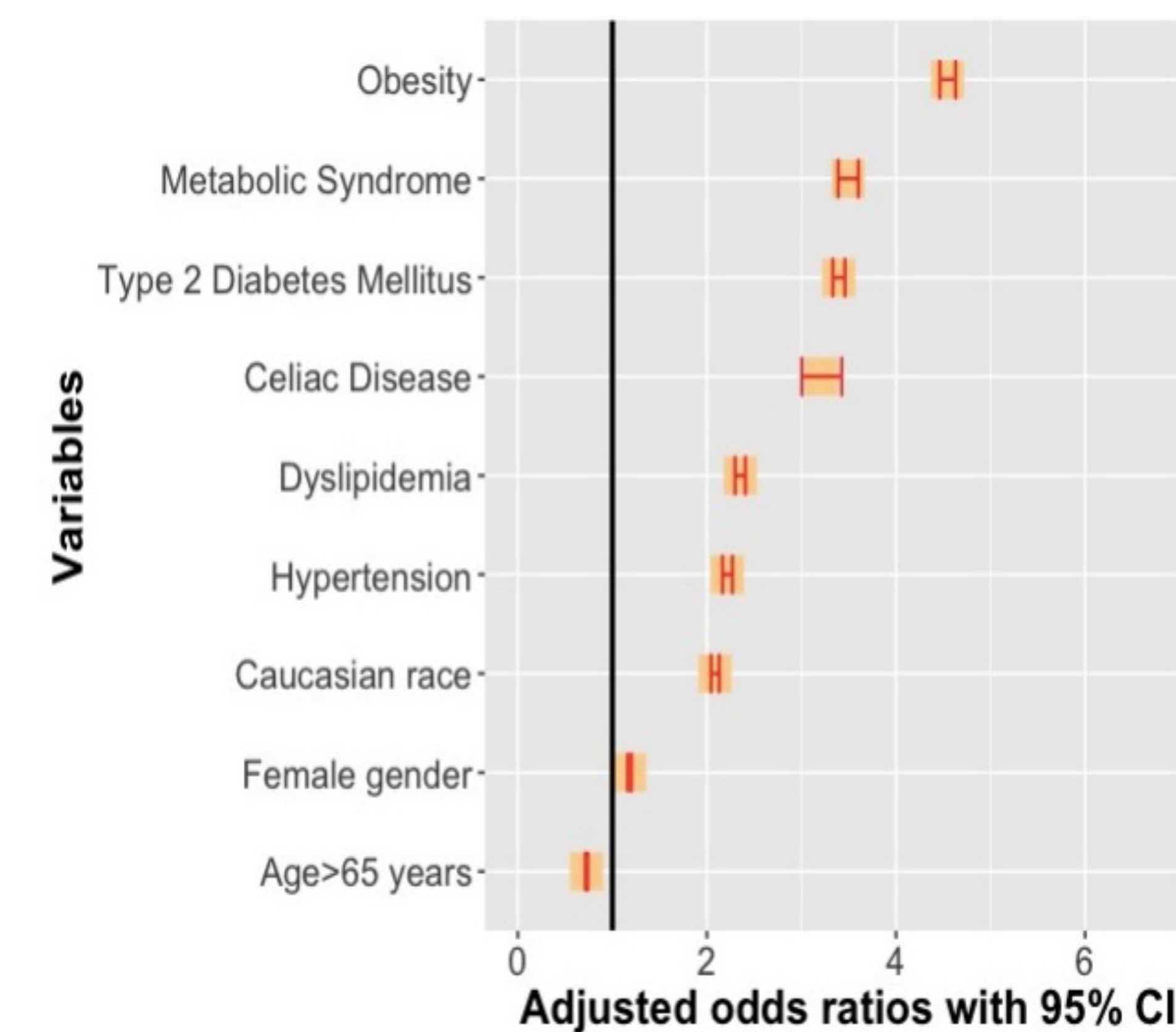
## Methods and Materials

Data were collected from a commercial database (Explorys, Inc, IBM Watson, Ohio). Adults with the diagnosis of “celiac disease,” based on the Systematized Nomenclature of Medicine–Clinical Terms, were included in the celiac disease group and the rest of the patients were included in the non-celiac disease group. The prevalence of NAFLD was compared in both groups. Age greater than 65 years, gender, Caucasian race, diabetes mellitus type 2 (T2DM), hypertension (HTN), dyslipidemia, obesity, and metabolic syndrome were considered as variables. Statistical univariate and multivariate analyses were performed using SPSS and R software.

**Table 1.** Baseline characteristics of study population

PARAMETER	CELIAC PATIENTS (n, % of total)	NON-CELIAC PATIENTS (n, % of total)
Age > 65	39,550 (28.87%)	20,898,740 (29.89%) *
Female	103,045 (75.21%)	38,314,220 (54.79%) *
Caucasian	113,250 (82.66%)	37,734,150 (53.97%) *
T2DM	19,960 (14.57%)	5,569,340 (7.97%) *
HTN	45,795 (33.43%)	13,875,325 (19.84%) *
Dyslipidemia	51,150 (37.33%)	11,462,960 (16.39%) *
Obesity	33,500 (24.45%)	5,409,610 (7.74%) *
Metabolic Syndrome	2,740 (2%)	237,685 (0.34%) *
NAFLD	955 (0.7%)	61,910 (0.09%) *
TOTAL	137,010	69,923,870

**Figure 1.** Multivariate Analysis of NAFLD in the study population.



## Results

Out of 69,923,870 patients, a total of 137,010 patients were diagnosed with celiac disease (0.2%). Amongst celiac disease patients, NAFLD was present in 955 patients (0.7%) (Table 1). In multivariate analysis, the odds of having NAFLD amongst patients with celiac disease was 3.21 (95% CI 3.01-3.43). While the odds of having NAFLD decreased in patients greater than 65 years of age, they increased in all other variables (Figure 1).

## Conclusions

Patients with celiac disease have increased prevalence and odds of having NAFLD. The odds remained significant when controlled for common risk factors for NAFLD, suggesting that celiac disease may be a risk factor. Hence, these patients may benefit from surveillance for NAFLD, although the frequency, feasibility and costs require further research.

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