

Supplemental tables

Supplemental table 1. Classic Celiac Disease Symptoms in Undiagnosed Celiac Disease Cases Compared With Serology-Negative Controls

Symptom (Total No.)	Serology Negative, No. (%) (n=562)	Serology Positive, No. (%) (n=281)	Matched Result^a OR (95% CI) (P Value)
Diarrhea (n=828)	19 (3)	8 (3)	0.83 (0.36-1.89) (.65)
Weight loss (n=826)	13 (2)	7 (3)	1.09 (0.43-2.78) (.86)
Abdominal pain (n=817)	53 (10)	24 (9)	0.86 (0.52-1.44) (.57)
IBS (n=825)	23 (4)	9 (3)	0.75 (0.34-1.66) (.48)
Anemia (n=827)	54 (10)	24 (9)	0.92 (0.55-1.55) (.76)

Abbreviations: IBS, irritable bowel syndrome; OR, odds ratio; CI, confidence interval.

^a Each classic celiac disease symptom was assessed for an association with positive serology using matched analysis (conditional logistic regression performed on matched sets, with matching variables included as adjusting covariates in each model)

Supplemental table 2. Matched Comparisons of Positive-tTGA Cases and tTGA-Negative Controls on Baseline Descriptors

Variable	No. (%) Missing	tTGA Negative (n=638)	tTGA Positive (n=319)	Matched Result OR (95% CI) [P-value]	Expression of OR
Age at Serum Draw (n=957)	0	35.3±9.5	35.3±9.5	-	<i>per 10-unit increase</i>
Female Gender (n=957)	0	396 (62%)	198 (62%)	-	
Race: (n=868)	89 (9%)			P=0.03 (3 d.f.)	
. Caucasian		518 (89%)	275 (95%)	1.0 (referent)	
. African American		23 (4%)	3 (1%)	0.20 (0.06-0.70)	
. Asian		32 (6%)	7 (2%)	0.45 (0.19-1.06)	
. Other		6 (1%)	4 (1%)	1.23 (0.32-4.73)	
Weight (kg) (n=861)	96 (10%)	81.2±23.9	81.9±21.0	1.03 (0.95-1.10) [.49]	<i>per 10-unit increase</i>
Height (cm) (n=876)	81 (8%)	169.7±9.8	169.6±9.6	0.99 (0.81-1.22) [.94]	<i>per 10-unit increase</i>
Body Mass Index (BMI) (n=834)	123 (13%)	28.0±7.3	28.4±6.5	1.10 (0.89-1.37) [.38]	<i>per 10-unit increase</i>
BMI categories: (n=834)	123 (13%)			P=0.06 (3 d.f.)	
. <25		231 (42%)	101 (35%)	1.0 (referent)	
. 25-30		144 (26%)	95 (33%)	1.71 (1.17-2.51)	
. 30-35		85 (16%)	43 (15%)	1.33 (0.84-2.12)	
. 35+		88 (16%)	47 (16%)	1.31 (0.82-2.08)	
Diarrhea, yes (n=940)	17 (2%)	23 (4%)	10 (3%)	0.85 (0.40-1.81) [.68]	
Ever Had Any GI Procedure, yes (n=957)	0	105 (16%)	55 (17%)	1.08 (0.74-1.60) [.68]	
Diabetes Mellitus Type I, yes (n=941)	16 (2%)	6 (1%)	6 (2%)	1.88 (0.60-5.87) [.27]	
Glucose Intolerance, yes (n=927)	30 (3%)	13 (2%)	8 (3%)	1.34 (0.55-3.29) [.52]	
Diabetes Mellitus Type II, yes (n=926)	31 (3%)	13 (2%)	12 (4%)	1.99 (0.87-4.57) [.10]	
Hypothyroid, yes (n=941)	16 (2%)	29 (5%)	29 (9%)	2.23 (1.28-3.89) [<.01]	
Herpes Zoster, yes (n=944)	13 (1%)	20 (3%)	3 (1%)	0.28 (0.08-0.95) [.04]	
Hemoglobin (g/dL) (n=638)	319 (33%)	13.7±1.5	13.7±1.8	0.98 (0.86-1.11) [.72]~	<i>per 1-unit increase</i>
Deficient Hemoglobin, yes (n=638)	319 (33%)	55 (13%)	27 (13%)	0.97 (0.59-1.60) [.92]~	
Cholesterol (mg/dL) (n=592)	365 (38%)	187.3±36.9	180.5±40.6	0.95 (0.91-1.00) [.04]~	<i>per 10-unit increase</i>
Excess Total Cholesterol, yes (n=592)	365 (38%)	31 (8%)	12 (6%)	0.73 (0.36-1.45) [.37]~	
Patient on Cholesterol Tx, yes (n=831)	126 (13%)	52 (9%)	20 (7%)	0.71 (0.39-1.29) [.26]	
Other Musculoskeletal symptom (n=937)	20 (2%)	142 (23%)	73 (23%)	1.01 (0.70-1.46) [.95]	
Ever Had Any Arthritis, yes (n=957)	0	37 (6%)	25 (8%)	1.53 (0.83-2.82) [.18]	

Variable	No. (%) Missing	tTGA Negative (n=638)	tTGA Positive (n=319)	Matched Result OR (95% CI) [P-value]	Expression of OR
Ever Had OA, yes (n=957)	0	8 (1%)	7 (2%)	1.73 (0.63-4.77) [.29]	
Ever Had RA, yes (n=957)	0	5 (1%)	5 (2%)	2.15 (0.56-8.21) [.26]	
Ever Had Gout, yes (n=957)	0	5 (1%)	1 (<1%)	0.38 (0.04-3.30) [.38]	
Ever Had Other Arthritis, yes (n=957)	0	23 (4%)	14 (4%)	1.33 (0.61-2.94) [.47]	
Weight Loss, yes (n=938)	19 (2%)	16 (3%)	10 (3%)	1.25 (0.55-2.85) [.60]	
Peptic Ulcer Disease, yes (n=932)	25 (3%)	5 (1%)	2 (1%)	1.04 (0.19-5.70) [.96]	
Abdominal Pain, yes (n=929)	28 (3%)	77 (12%)	39 (13%)	0.97 (0.63-1.49) [.89]	
Chronic Ulcerative Colitis, yes (n=939)	18 (2%)	11 (2%)	1 (<1%)	0.18 (0.02-1.42) [.10]	
Crohn's Disease, yes (n=934)	23 (2%)	4 (1%)	0 (0%)	-	
IBS, yes (n=939)	18 (2%)	26 (4%)	11 (4%)	0.82 (0.40-1.70) [.60]	
Constipation, yes (n=938)	19 (2%)	32 (5%)	13 (4%)	0.79 (0.40-1.56) [.50]	
GERD, yes (n=931)	26 (3%)	89 (14%)	42 (13%)	0.93 (0.62-1.39) [.72]	
Any Other GI Symptom, yes (n=957)	0	71 (11%)	25 (8%)	0.65 (0.39-1.08) [.10]	
EGD Ever Done, yes (n=957)	0	31 (5%)	19 (6%)	1.26 (0.70-2.27) [.45]	
Any Colonoscopy, yes (n=957)	0	26 (4%)	16 (5%)	1.28 (0.67-2.45) [.46]	
Any EGD, yes (n=957)	0	21 (3%)	12 (4%)	1.16 (0.56-2.41) [.70]	
Any Abd X Ray, yes (n=957)	0	19 (3%)	7 (2%)	0.75 (0.31-1.78) [.51]	
Any Abd CT Scan, yes (n=957)	0	34 (5%)	21 (7%)	1.27 (0.72-2.25) [.40]	
Any Other GI Proc, yes (n=957)	0	42 (7%)	16 (5%)	0.72 (0.39-1.34) [.30]	
Systemic Lupus Erythematosus (n=925)	32 (3%)	4 (1%)	2 (1%)	1.00 (0.18-5.45) [>.99]	
Hyperthyroid, yes (n=924)	33 (3%)	3 (<1%)	5 (2%)	3.26 (0.77-13.88) [.11]	
Any Autoimmune Disorder, yes (n=946)	11 (1%)	108 (17%)	72 (23%)	1.50 (1.05-2.14) [.03]	
Cerebrovascular Disease, yes (n=939)	18 (2%)	13 (2%)	7 (2%)	1.11 (0.40-3.12) [.84]	
Seizure, yes (n=941)	16 (2%)	15 (2%)	2 (1%)	0.25 (0.06-1.13) [.07]	
Ischemic Heart Disease, yes (n=939)	18 (2%)	5 (1%)	4 (1%)	1.60 (0.43-5.97) [.48]	
Pericarditis, yes (n=940)	17 (2%)	2 (<1%)	1 (<1%)	0.98 (0.09-10.85) [.99]	
Pneumonia, yes (n=940)	17 (2%)	27 (4%)	16 (5%)	1.20 (0.63-2.29) [.58]	
Gastroenteritis, yes (n=939)	18 (2%)	44 (7%)	19 (6%)	0.86 (0.49-1.50) [.59]	
Bronchitis, yes (n=933)	24 (3%)	79 (13%)	43 (14%)	1.13 (0.73-1.75) [.59]	
Other Infection, yes (n=939)	18 (2%)	188 (30%)	85 (27%)	0.83 (0.58-1.19) [.31]	
Anemia, yes (n=939)	18 (2%)	55 (9%)	29 (9%)	1.13 (0.69-1.83) [.63]	
Other Symptom, yes (n=934)	23 (2%)	153 (25%)	63 (20%)	0.74 (0.50-1.07) [.11]	
Any Cancer, yes (n=957)	0	48 (8%)	24 (8%)	1.01 (0.60-1.70) [.96]	
Any Visceral Cancer, yes (n=957)	0	5 (1%)	4 (1%)	1.75 (0.42-7.22) [.44]	

Variable	No. (%) Missing	tTGA Negative (n=638)	tTGA Positive (n=319)	Matched Result OR (95% CI) [P-value]	Expression of OR
Small Intestine Malabsorption (n=955)	2 (<1%)	137 (22%)	79 (25%)	1.24 (0.89-1.71) [.20]	
B12 (ng/L)^ (n=53)	904 (94%)	442.5 (288.5, 596)	389 (290, 431)	0.56 (0.30-1.07) [.08]~	per 1-SD on log-scale
Deficient Vitamin B12, yes (n=53)	904 (94%)	2 (6%)	3 (18%)	4.54 (0.54-38.32) [.16]~	
Folate (Serum) (ug/L)^ (n=36)	921 (96%)	13.3 (10.0, 15.7)	12.4 (7.9, 18.0)	0.68 (0.30-1.58) [.37]~	per 1-SD on log-scale
Deficient Folate, yes (n=36)	921 (96%)	1 (4%)	0 (0%)	- ~	
Iron (ug/dL)^ (n=64)	893 (93%)	88.0 (55.0, 106.0)	66.5 (34.0, 114.0)	0.70 (0.41-1.22) [.21]~	per 1-SD on log-scale
Deficient Iron, yes (n=64)	893 (93%)	5 (13%)	7 (27%)	2.00 (0.52-7.72) [.31]~	
Ferritin (ug/L)^ (n=106)	851 (89%)	31 (15, 56)	13.5 (5, 39)	0.41 (0.22-0.74) [<.01]~	per 1-SD on log-scale
Deficient Ferritin, yes (n=106)	851 (89%)	12 (17%)	15 (42%)	3.89 (1.46-10.40) [<.01]~	
Total Vitamin D (ng/mL)^ (n=40)	917 (96%)	25.0 (18.0, 36.0)	24.0 (19.0, 35.0)	0.79 (0.41-1.54) [.50]~	per 1-SD on log-scale
Calcium (mG/dL) (n=165)	792 (83%)	9.5±0.5	9.6±0.5	1.23 (0.66-2.31) [.52]~	per 1-unit increase
Albumin (g/dL)^ (n=85)	872 (91%)	4.1 (3.9, 4.5)	4.2 (3.8, 4.5)	0.92 (0.56-1.52) [.75]~	per 1-SD on log-scale
Deficient Albumin, yes (n=85)	872 (91%)	5 (9%)	1 (4%)	0.48 (0.05-4.66) [.52]~	
Neuropathy, yes (n=945)	12 (1%)	8 (1%)	6 (2%)	1.54 (0.51-4.66) [.45]	
Depression, yes (n=942)	15 (2%)	148 (24%)	68 (22%)	0.92 (0.65-1.30) [.63]	
Fibromyalgia, yes (n=936)	21 (2%)	14 (2%)	1 (<1%)	0.12 (0.02-0.94) [.04]	
Chronic Fatigue, yes (n=944)	13 (1%)	46 (7%)	39 (13%)	1.88 (1.20-2.97) [<.01]	
Any Fracture, yes (n=957)	0	69 (11%)	33 (10%)	0.94 (0.60-1.47) [.80]	
Any Skeletal Condition, yes (n=957)	0	15 (2%)	6 (2%)	0.78 (0.30-2.06) [.62]	
Osteopenia, yes (n=957)	0	8 (1%)	2 (1%)	0.49 (0.10-2.30) [.36]	
Osteoporosis, yes (n=957)	0	2 (<1%)	1 (<1%)	0.99 (0.09-10.97) [>.99]	

Note: categorical variables reported as n (%), while continuous variables are presented as mean±SD unless noted otherwise.

^Due to skewness, continuous variable is described with median (IQR) and modeled in logistic regression with log-transformed data.

~Unmatched analysis (binary logistic regression) used to minimize the extent of casewise deletion from missing data

Supplemental table 3. Odds Ratios and values in the current study (adults 18-15) vs. the previous study (adults 50 years or older). In this table, Odds ratios were calculated by the comparison between sero-positive and sero-negative in each population (adults 18-50 and adults 50 years older)

<i>Variable</i>	<i>The current study population (adults 18-50)</i>	<i>Previous study (adults 50 years older)</i>
	<i>Sero-positive (n=281)</i>	<i>Sero-positive (n=127) Vs. Sero-negative (n=254)</i>
<i>Demographics</i>		
Age at Serum Draw	35.1±9.5	64.9±8.4
Female gender	64%	51%
Body Mass Index (BMI) ⁻	28.1±7.3	26.8±4.9
	<i>Sero-positive (n=281) vs. Sero-Negative (n=562) Unadjusted OR (95% CI)</i>	<i>Sero-positive (n=127) Vs. Sero-negative (n=254) Unadjusted OR (95% CI)</i>
<i>Gastrointestinal Symptoms/Diseases</i>		
Diarrhea, yes	0.83 (0.36, 1.89)	0.84 (0.51, 1.38)
Weight Loss, yes	1.09 (0.43, 2.78)	1.74 (0.88, 3.45)
Abdominal Pain, yes	0.86 (0.52, 1.44)	0.86 (0.56, 1.33)
IBS, yes	0.75 (0.34, 1.66)	0.86 (0.44, 1.65)
Constipation, yes	0.62 (0.27, 1.41)	1.26 (0.69, 2.29)
<i>Autoimmune/Endocrine Disorders</i>		
Any Autoimmune Disorder, yes	1.58 (1.08, 2.30)	0.89 (0.57, 1.38)
Diabetes Mellitus Type I, yes	3.05 (0.72, 12.86)	2.07 (0.13, 33.21)
Hypothyroid, yes	2.20 (1.21, 4.01)	2.41 (1.26, 4.61)
<i>Skeletal/Bone Measures</i>		
Any Fractures, yes	0.91 (0.55, 1.49)	1.19 (0.76, 1.85)
Osteopenia, yes	0.48 (0.10, 2.29)	1.33 (0.71, 2.50)