

Association between Celiac Disease and Hemoglobin A1c Levels in Type 1 Diabetes Pediatric Patients

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Introduction

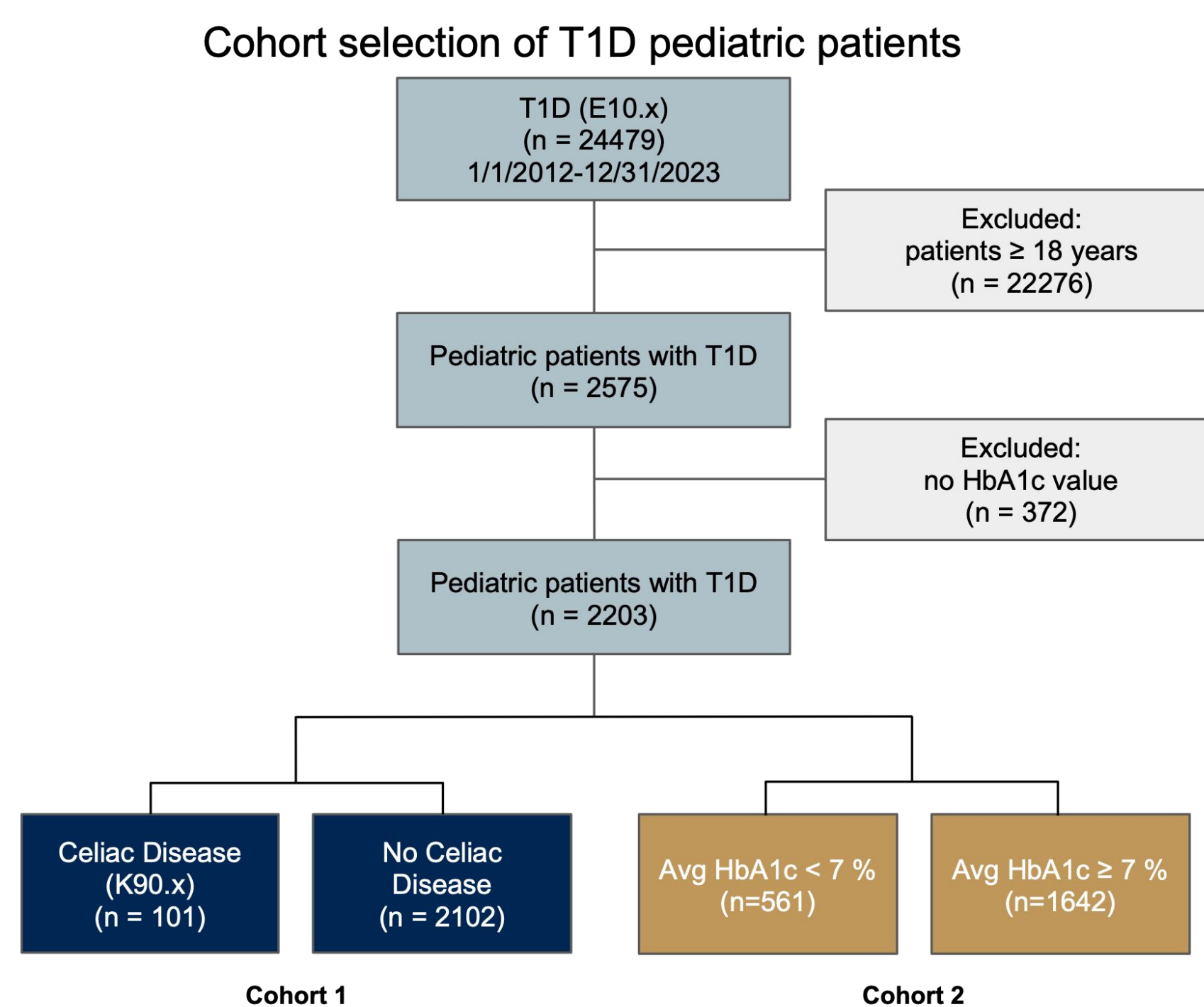
- Approximately 6% of individuals with Type 1 Diabetes (T1D) also develop Celiac Disease (CD).¹
- Prevalence estimates vary widely depending on population and diagnostic criteria, with serology-based studies in children reporting rates between 1.4% and 24.5%.²
- The current American Diabetes Association guidelines recommend routine screening for CD in individuals with T1D to ensure early detection and appropriate management.³
- Children with both T1D and CD face greater barriers to adhering to a gluten-free diet compared to those with CD alone.⁴
- Existing studies offer mixed findings on the relationship between CD and glycemic control.⁵⁻⁷

Aims and Objectives

- This study evaluates the association between CD and HbA1c levels in pediatric patients with T1D, providing new insights into how CD diagnosis influences glycemic control in this high-risk population.

Methods

- A retrospective chart review of T1D patients identified using ICD-10 code (E10.x) between 2012 and 2023 at Corewell Health East, Michigan was conducted.
- The study inclusion criteria were: (1) age <18 years at any visit during the study period, (2) diagnosis of T1D recorded in the medical record, and (3) at least one HbA1c measurement available. Patients were excluded if they had missing demographic data or incomplete diagnostic information.

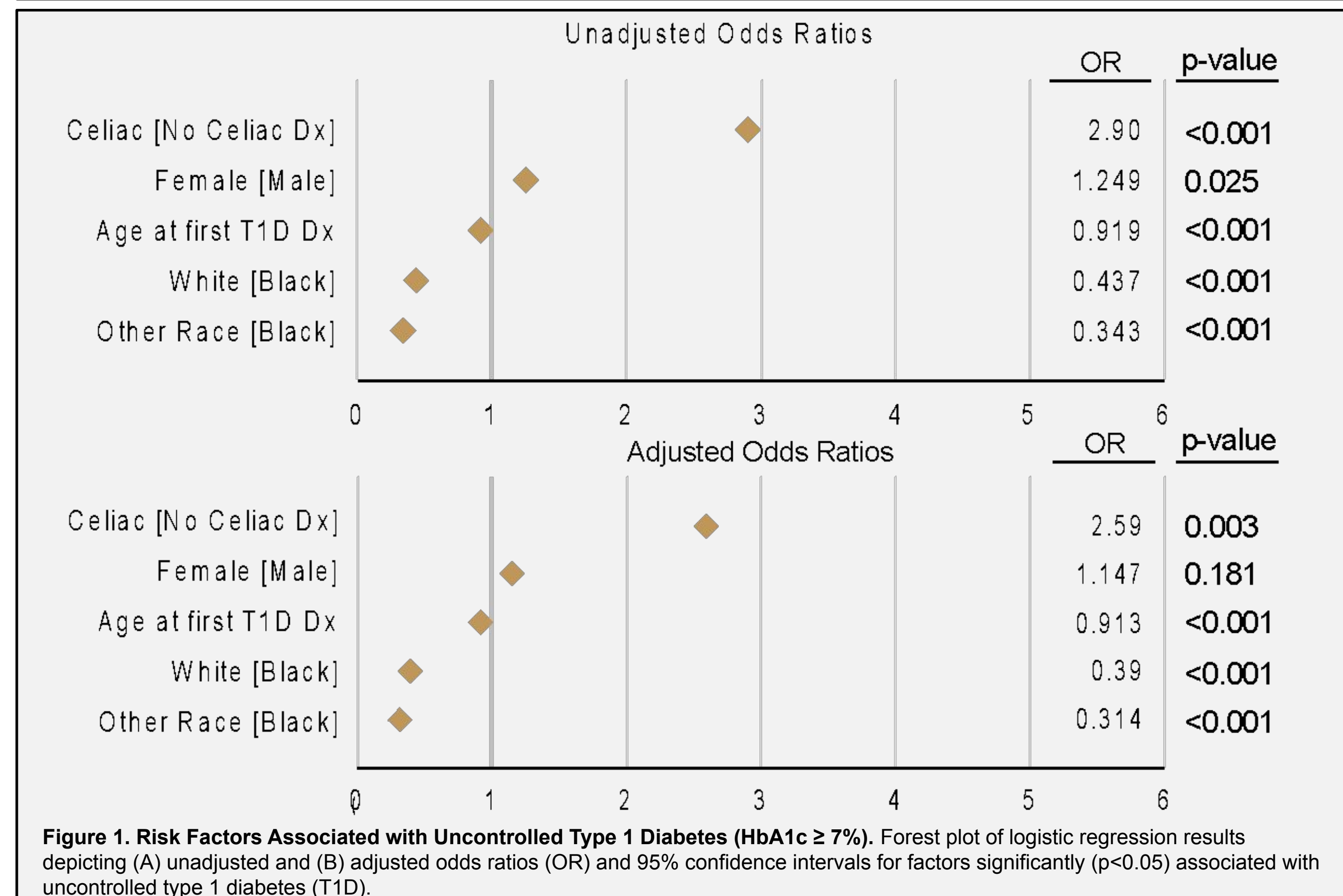


Results

- Of the 2203 pediatric patients with T1D, 4.6% (n=101) had concurrent CD diagnosis.
- T1D patients with CD had a significantly higher number of HbA1c measurements.
- A higher proportion of T1D patients with CD had an average HbA1c ≥ 7 (uncontrolled) compared to those without (89.1% vs. 73.8%, p<0.0006).
- Using regression analysis, T1D patients with CD had significantly higher odds of having uncontrolled HbA1c levels (adj OR: 2.59, 95% CI: 1.37-4.90) after adjusting for age, race and sex (Figure 1).

Table 1. Characteristics of Pediatric Patients with Type 1 Diabetes 2012-2023 at Corewell Health East							
Variable	All	Celiac Disease			Controlled HbA1c (<7%)		
		No	Yes	p-value*	Yes	No	p-value*
Sample, n (row %)	2203	2102 (95.4)	101 (4.6)	-	561 (25.5)	1642 (74.5)	-
Age, median (IQR)	12 (8-15)	12 (8-15)	9 (5-12)	<0.0001	13 (10-15)	11 (8-14)	<.0001
Female, n (col %)	1009 (45.8)	956 (45.5)	53 (52.5)	0.1681	234 (41.7)	775 (47.2)	0.0243
Race, n (col %)				0.0277			<.0001
White/Caucasian	1524 (70.3)	1442 (68.6)	82 (81.2)		412 (73.5)	1112 (67.7)	
Black/AA	373 (17.2)	364 (17.3)	9 (8.9)		52 (9.3)	321 (19.5)	
Other	271 (12.5)	262 (12.5)	9 (8.9)		87 (15.5)	184 (11.2)	
ND	35	34	1		10	25	
Ethnicity (col %)				0.1471			<.0001
Arab or Middle Eastern Descent	171 (8.1)	162 (7.7)	9 (8.9)		72 (13.9)	99 (6.7)	
Hispanic/Latino	81 (3.8)	81 (3.9)	0 (0.0)		32 (6.2)	49 (3.3)	
Non Hispanic/Latino	1632 (77.2)	1549 (73.7)	83 (82.2)		349 (67.3)	1283 (83.6)	
Other	229 (10.8)	221 (10.5)	8 (7.9)		80 (15.4)	149 (9.7)	
ND	90	89	1		28	62	
Average of all A1c values, Mean (SD)	8.36 (2.29)	8.36 (2.32)	8.49 (1.51)	0.5563	5.54 (0.69)	9.33 (1.79)	<.0001
Number of A1c values, median (IQR)	8 (2-17)	8 (2-16)	14 (7-27)	<0.0001	2 (1-4)	11 (5-20)	<.0001
HbA1c ≥ 7% (col %)	1642 (74.5)	1552 (73.8)	90 (89.1)	0.0006	561 (0)	1642 (100)	-
Celiac Disease (col %)	101 (4.6)	0 (0)	101 (100)	-	11 (2.0)	90 (5.5)	0.0006

*p-values were determined using Chi-Square or Fisher's Exact test for categorical variables and Wilcoxin test for continuous variables.



Conclusions

- CD is significantly associated with poorer glycemic control in pediatric patients with T1D, independent of age, race, and sex.
- T1D patients with CD had more frequent HbA1c measurements, suggesting increased glycemic variability or challenges in control.
- Our study emphasizes the importance of routine celiac disease screening, close follow-up, and tailored management in pediatric patients with T1D.
- Poorer glycemic outcomes were observed in younger patients and Black individuals, reflecting age and racial disparities.
- Additional attention to racial disparities and younger age at diagnosis is warranted to improve long-term outcomes.
- Healthcare providers must deliver more tailored, effective care for patients with both CD and T1D.

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