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THE INCIDENCE OF CELIAC DISEASE IN CHILDREN WITH DIABETES MELLITUS TYPE 1

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ABSTRACT

Background: While the association between type 1 diabetes mellitus (T1DM) and celiac disease (CD) is well recognized, the clinical presentation and features of both conditions when occurring together are not thoroughly documented, especially in local clinical settings. **Aim of the Study:** This study aimed to estimate the incidence of celiac disease among children with T1DM attending the pediatric diabetic clinic at Babylon Maternity and Pediatric Teaching Hospital. **Patients and Methods:** A retrospective study was conducted involving 50 patients diagnosed with T1DM who attended the pediatric diabetic clinic. These patients were screened for celiac disease using serological testing for anti-tissue transglutaminase antibodies. A control group of 50 children without diabetes mellitus was also included for comparison. Controls were selected from those admitted to the hospital for conditions such as gastroenteritis or chest infections, with no history of chronic illness, no clinical suspicion of diabetes, and normal baseline investigations. **Results:** Among the 50 diabetic patients, 3 cases (6%) tested positive for celiac antibodies. Interestingly, these patients were mostly asymptomatic, and there was no consistent timeframe between the diagnosis of T1DM and the detection of celiac antibodies. In contrast, several patients with classical symptoms of celiac disease, including chronic diarrhea, anorexia, abdominal distension, foul-smelling stools, short stature, and unexplained hypochromic anemia, had negative serological screening results. **Conclusion:** This study highlights the atypical presentation of celiac disease in children with T1DM. Routine screening is essential, as positive cases may lack typical symptoms, and symptomatic patients may still test negative.

KEYWORDS:

INTRODUCTION

Type 1 diabetes mellitus (T1DM) and celiac disease (CD) are both autoimmune disorders with strong genetic and environmental influences.[1] The co-occurrence of these diseases is well documented and is believed to be due to shared genetic susceptibility, particularly within the human leukocyte antigen (HLA) region. Both conditions are commonly associated with HLA-DQ2 and DQ8 haplotypes, with around 90% of CD patients expressing the DQ2 heterodimer and 7% expressing DQ8.[2] Interestingly, patients who do not carry either of these haplotypes are highly unlikely to develop CD.[3] Beyond the HLA region, recent research has identified at least seven shared non-HLA loci between CD and T1DM, such as RGS1, IL18RAP, TAGAP, PTPN2, CTLA4, SH2B3, and a 32-bp insertion-deletion variant, suggesting a common pathogenic mechanism.[3] An emerging hypothesis is the "intestinal diabetes" model, which posits that dietary gluten and gut microbiota play key roles in altering gut permeability and immune responses, potentially contributing to the development of T1DM.[4] This theory underlines the gut's central role in systemic autoimmunity and the importance of further investigating environmental triggers and immune dysregulation in both diseases. Epidemiological studies suggest that the prevalence of CD in the general population is close to 1%, but this rises significantly—by approximately 5 to 7 times—in patients with T1DM.[5,6] Pediatric studies worldwide show a wide prevalence range, from 2.4% in Finland to 16.4% in Algeria.[7] CD in children can lead to significant morbidity, including growth failure, anemia, delayed puberty, and gastrointestinal malignancies. Delayed diagnosis and non-adherence to a gluten-free diet are associated with

increased mortality, particularly due to intestinal lymphoma.[8] The clinical presentation of CD is highly variable and may range from typical gastrointestinal symptoms in early childhood to atypical or silent presentations later in life.[9] This variation complicates diagnosis, especially in high-risk populations like children with T1DM, where asymptomatic or mild presentations are common.[10,11] In fact, CD may present subtly, with only mild fatigue or slowed growth, or it may go unnoticed in overweight or obese children.[12] This underlines the importance of routine screening in T1DM patients. Given these complexities, this study aims to estimate the incidence of CD in children with T1DM and to explore the timing and clinical presentation of CD in this high-risk group.

METHOD

This retrospective study involved two groups of children aged 2 to 12 years, conducted at the Babylon Maternity and Pediatric Teaching Hospital in Babel from October 17, 2011, to June 17, 2012. Group A included 50 known cases of type 1 diabetes mellitus (T1DM), with 27 males and 23 females, and a mean age of 7 years. These patients were classified into preschool, school-age, and adolescent subgroups. All patients were screened for celiac disease at the time of diabetes diagnosis using serologic testing for anti-tissue transglutaminase (anti-TTG) antibodies. Two milliliters of blood were collected from each patient into plain tubes (without EDTA), centrifuged to obtain serum, and tested using Aeskulisa kits (Germany). The test principle involved binding of diluted patient serum to microplates coated with TTG antigen, followed by detection with enzyme-linked anti-human IgG and colorimetric development using TMB substrate. A result was considered negative if antibody levels were <12 IU, equivocal if between 12–18 IU, and positive if >18 IU. Patients with positive results were referred for upper endoscopy and biopsy, with histological confirmation of celiac disease based on villous atrophy, crypt hyperplasia, and intraepithelial lymphocytosis. Those diagnosed were advised to follow a strict gluten-free diet. Anthropometric data (height and weight) were recorded for all diabetic patients and compared between celiac-positive and celiac-negative groups using growth charts. Glycemic control was assessed via HbA1c levels, measured from 5 ml of EDTA-anticoagulated blood using standard laboratory procedures. HbA1c levels <6% indicated normal control; 6–8% good, 8–10% fair, and >10% poor control. Group B, the control group, included 50 non-diabetic children (matched by age and sex) admitted for other illnesses. They were screened for anti-TTG antibodies and HbA1c levels, and their anthropometric measurements were compared with those of the diabetic group. Statistical analysis was performed using SPSS version 13, with a p-value <0.05 considered significant.

RESULTS

Only 6% (3 patients) have celiac disease, compared with 0.0% of control group, and it is not statistically significant. P value= 0.242. as in table 1.

Table 1: Incidence of Celiac Disease in Patients and Control.

Title	Celiac +ve	Celiac -ve	Total
Patients	**3**	**47**	**50**
Control	**0**	**50**	**50**

This table compares the age distribution of celiac disease between T1DM patients (Group A) and non-diabetic controls (Group B). All three celiac-positive cases occurred in the patient group, mainly in the 6–<11 years' category. No celiac-positive cases were found in the control group across all age brackets. However, the differences in age-specific distribution between the groups were not statistically significant ($p > 0.05$), likely due to the small sample size. As in table 2.

Table 2: Age Distribution of Celiac Disease in Patients and Control Group.

Age Group (Years)	Celiac Positive (Group A)	Celiac Negative (Group A)	Total (Group A)	Celiac Positive (Group B)	Celiac Negative (Group B)	Total (Group B)	p-value
<6	1 (2%)	14 (28%)	15	0 (0%)	15 (30%)	15	0.748
≥6–<11	2 (4%)	26 (52%)	28	0 (0%)	28 (46%)	28	0.527
≥11	0 (0%)	7 (14%)	7	0 (0%)	7 (14%)	7	0.913
Total	3 (6%)	47 (94%)	50	0 (0%)	50 (100%)	50	0.242

There was no statistical significance to get celiac disease regarding gender of the patients. As in table 3.

Table 3: Sex Distribution of Celiac Disease in Patients and Control Group.

Sex	Celiac Positive (Group A)	Celiac Negative (Group A)	Total (Group A)	Celiac Positive (Group B)	Celiac Negative (Group B)	Total (Group B)	p-value
Male	1 (2%)	26 (52%)	27	0 (0%)	27 (54%)	27	0.533
Female	2 (4%)	21 (42%)	23	0 (0%)	23 (46%)	23	0.412
Total	3 (6%)	47 (94%)	50	0 (0%)	50 (100%)	50	0.297

Two third of patients with positive antibodies, getting positive biopsy results. As in table 4.

Table 4: Classification of Positive Cases According To Age, Serology, and Biopsy Results.

Subject no.	Age (yrs.)	Antibodies +ve	Biopsy result
1	5.5	TTG	+VE
2	7	TTG	+VE
3	11	TTG	-VE

All of the positive celiac patients, getting their diagnosis in the 1st two years from the onset of T1DM. as in table 5.

Table 5: Interval Between Diagnosis of Type1 Diabetes Mellitus And Detection of Celiac Antibodies.

Patient	Interval (months)
Patient 1	**6**
Patient 2	**13**
Patient 3	**16**

There was no classical presentation of celiac disease in diabetic patients. As in table 6.

Table 6: Gastrointestinal Symptoms In Patients with T1dm As Having Celiac Antibodies+Ve Test.

Patient	Sex	Age(yrs.)	Gastrointestinal symptoms
1	Male	5.5	None.
2	Female	7	Abdominal pain.
3	Female	11	Abdominal pain, weight loss, abdominal distension, offensive smelling stool.

There was a statistical significance of growth retardation among diabetic patients with celiac positive test, compared to diabetic with no celiac disease. As in table 7.

Table 7: Mean Height and Weight Among Positive and Negative Diabetic Patients.

Mean	Diabetic with celiac +ve	Diabetic with celiac -ve	P-value
Mean HT (cm)	**110.25 cm**	**138 cm**	**0.027**
Mean WT (kg)	**16.5 kg**	**25 kg**	**0.046**

There was no statistical significance regarding glycosylated hemoglobin in diabetic patients with or without celiac disease. P value= 0.395. as in table 8.

Table (8): glycosylated hemoglobin correlation in both positive and negative diabetic patients.

Diabetic patient with celiac +ve	Glycosylated hemoglobin	Diabetic patient with celiac -ve	Glycosylated hemoglobin
1	**8.8 (7.7-9.9)**	**1**	**8.6 (7.8-9.4)**
2	**14.25 (10.7-17.8)**	**2**	**9.6 (7.1-12.1)**
3	**10.4 (9.2-11.6)**	**3**	**10.4 (8.8-12.1)**
mean	**11.15**	**mean**	**9.53**

DISCUSSION

The findings of this study reveal that 3 out of 50 children with type 1 diabetes mellitus (T1DM), representing 6%, tested positive for celiac disease (CD) via serologic screening. None of the 50 children in the non-diabetic control group tested positive, highlighting a higher incidence of CD among diabetic patients. This observation is in line with similar research conducted in Saudi Arabia, which reported a comparable prevalence rate.[13] The increased incidence among T1DM patients is likely due to a shared autoimmune pathogenesis. Both conditions are closely associated with the human leukocyte antigen (HLA) class II DQ2 and DQ8 haplotypes, indicating a common genetic predisposition.[14,15] The majority of CD cases in our cohort were within the 7–11-year age range; however, the difference in age distribution between the diabetic and control groups was not statistically significant. This may be attributed to the limited sample size in both groups. A study from Canada, in contrast, demonstrated a significant age-related association with CD in T1DM, possibly due to larger sample sizes and broader population representation.[16] Interestingly, clinical symptoms such as diarrhea, abdominal pain, and anorexia did not correlate with positive serologic results in our study. This finding aligns with that of Ertekin et al., who reported that many Turkish children diagnosed with CD were asymptomatic or presented with vague complaints.[17] These findings underscore the inadequacy of relying solely on clinical symptoms for diagnosis and reinforce the importance of serologic screening and confirmatory small bowel biopsy.[18,19] Since many CD cases in T1DM patients are asymptomatic, routine screening can facilitate early diagnosis and help prevent

complications such as growth failure, delayed puberty, and intestinal malignancies.[20] We found a statistically significant reduction in mean weight and height among diabetic patients with positive CD compared to those without. These patients fell below the 3rd percentile, indicating that CD may contribute additional growth failure in children already managing T1DM. While some studies reported only short stature[21], and others found no significant anthropometric differences[22], our findings support the hypothesis that villous atrophy and nutrient malabsorption in CD can compound the effects of diabetes on growth.[23] Lastly, the mean HbA1c in patients with both T1DM and CD was higher (11.5%) compared to diabetic-only patients (9.53%), suggesting poorer glycemic control, although this difference was not statistically significant. This observation is consistent with findings from Finland[24] and may be related to decreased pancreatic enzyme secretion and altered nutrient absorption in CD.[24,25] However, the lack of statistical significance may be due to the small number of CD-positive cases in our cohort.

CONCLUSION

Six percent of T1DM associated with celiac disease, and its occurrence associated with increase malabsorption and growth failure. Results of our study show different presentations of celiac disease, investigations include celiac antibodies and biopsy are mandatory for the diagnosis of celiac disease.

REFERENCES

1. Rostom A, Dube C, Cranney A, et al. Celiac disease. Summary, evidence report/technology assessment No.104. Rockville (MD): Agency for Healthcare Research and Quality (US)., 2004.
2. Kaukinen K, Partanen J, Mäki M, Collin P. HLA-DQ typing in the diagnosis of celiac disease. Am J Gastroenterol, 2002; 97(3): 695–9.
3. Smyth DJ, Plagnol V, Walker NM, et al. Shared and distinct genetic variants in type 1 diabetes and celiac disease. N Engl J Med., 2008; 359(26): 2767–77.
4. Vaarala O, Atkinson MA, Neu J. The "perfect storm" for type 1 diabetes: the complex interplay between intestinal microbiota, gut permeability, and mucosal immunity. Diabetes, 2008; 57(10): 2555–62.
5. Fasano A, Berti I, Gerarduzzi T, et al. Prevalence of celiac disease in at-risk and not-at-risk groups in the United States: a large multicenter study. Arch Intern Med., 2003; 163(3): 286–92.
6. Aktay AN, Lee PC, Kumar V, Parton E, Wyatt DT, Werlin SL. The prevalence and clinical characteristics of celiac disease in juvenile diabetes in Wisconsin. J Pediatr Gastroenterol Nutr., 2001; 33(4): 462–5.
7. Saukkonen T, Savilahti E, Reijonen H, et al. Celiac disease: frequent occurrence after clinical onset of insulin-dependent diabetes mellitus. Diabet Med., 2000; 13(5): 464–70.
8. Boudraa G, Hachelaf W, Benbouabdellah M, et al. Prevalence of coeliac disease in diabetic children and their first-degree relatives in west Algeria: screening with serological markers. Acta Paediatr, 2000; 89(412): 58–60.
9. Mahmud FH, Murray JA, Kudva YC, et al. Celiac disease in type 1 diabetes mellitus in a North American community: prevalence, serologic screening, and clinical features. Mayo Clin Proc., 2005; 80(11): 1429–34.
10. McGowan KE, Castiglione DA, Butzner JD. The changing face of childhood celiac disease in North America: impact of serological testing. Pediatrics, 2009; 124(6): 1572–8.
11. Rampertab SD, Pooran N, Brar P, et al. Trends in the presentation of celiac disease. Am J Med., 2006; 119(4): 355–60.
12. Hummel M, Ziegler AG, Bonifacio E. Type 1 diabetes mellitus, celiac disease and their association-lessons from antibodies. J Pediatr Endocrinol Metab, 2001; 14(1): 607–10.
13. Catassi C, Kryszak D, Louis-Jacques O, et al. Detection of celiac disease in primary care: a multicenter case-finding study in North America. Am J Gastroenterol, 2007; 102(7): 1454–60.
14. Hanas R, Donaghue KC, Klingensmith G, Swift PG. ISPAD clinical practice consensus guidelines. Introduction. Pediatr Diabetes, 2009; 10(12): 1–2.
15. Prince HE. Evaluation of the INOVA diagnostics enzyme-linked immunosorbent assay kits for measuring serum IgG and IgA to deamidated gliadin peptides. Clin Vaccine Immunol, 2006; 13(2): 150–1.
16. Sanchez-Albisua I, Wolf J, Neu A, et al. Celiac disease in children with type 1 diabetes mellitus: the effect of the gluten-free diet. Diabet Med., 2005; 22(8): 1079–82.
17. Ertekin V, Selimoğlu MA, Doneray H, et al. Prevalence of celiac disease in a sample of Turkish children and adolescents with type 1 diabetes mellitus. J Clin Gastroenterol, 2006; 40(8): 655–8.
18. Lunt H, Florkowski CM, Cook HB, et al. Bone mineral density, type 1 diabetes, and celiac disease. Diabetes Care, 2001; 24(5): 791–2.
19. Schweizer JJ, Oren A, Mearin ML. Cancer in children with celiac disease: a survey of the European Society of Pediatric Gastroenterology, Hepatology and Nutrition. J Pediatr Gastroenterol Nutr., 2001; 33(1): 97–100.
20. Barera G, Bonfanti R, Viscardi M, et al. Occurrence of celiac disease after onset of type 1 diabetes: a 6-year prospective longitudinal study. Pediatrics, 2002; 109(5): 833–8.
21. Hummel M, Bonifacio E, Stern M, et al. Development of celiac disease-associated antibodies in offspring of parents with type 1 diabetes. Diabetologia, 2000; 43(8): 1005–11.
22. Andreelli F, Plotton I, Riou JP, Thivolet C. Diabetic instability and celiac disease: a frequent association

to keep in mind. Diabetes Care, 1998; 21(12): 2192–3.
23. Cronin CC, Feighery A, Ferriss JB, et al. High prevalence of celiac disease among patients with insulin-dependent (type 1) diabetes mellitus. Am J Gastroenterol, 2002; 92(12): 2210–2.
24. Barker JM, Liu E. Celiac disease: pathophysiology, clinical manifestations, and associated autoimmune conditions. Adv Pediatr, 2008; 55: 349–65.
25. Lorini R, Scaramuzza A, Vitali L, et al. Clinical aspects of celiac disease in children with insulin-dependent diabetes mellitus. J Pediatr Endocrinol Metab, 1996; 9(1): 101–11.