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Original Research Article

Correlation of Celiac Disease with Type I Diabetes mellitus.

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Abstract: ***Background:*** Type 1 diabetes mellitus (Type 1 DM) and Celiac disease (CD) are autoimmune disorders with a common genetic basis. Celiac disease often presents with atypical findings or sometimes asymptomatic, leading to delayed diagnosis and potential complications. The objective of our study is to evaluate the correlation of Celiac Disease (CD) with type I Diabetes Mellitus (DM). ***Methods:*** This cross-sectional study, uniquely designed and executed, involved 77 Type 1 DM patients sampled via purposive sampling. The criteria for diagnosing the type I DM patient was fasting blood sugar > 126 mg/dl and HbA1c > 6.5%. Levels of IgA anti-tissue transglutaminase TTG (IgA) antibodies was measured. In patients with negative result but with strong clinical suspicion of CD, serum IgA and IgG anti-tissue transglutaminase (TTG) antibodies performed. The value above reference range was considered positive for Celiac disease. The data were meticulously analyzed using SPSS V.26, with significance at a p-value < 0.05. ***Results:*** In our study the mean age was 21±9.24 years. There were 43(55.8%) males, while 34(44.2%) were female. The male to female ratio was 1.26:1. The mean duration of DM was 9.46+8.1 years and HbA1c level 9.51+ 2.03. There was weight loss 42 (54.5%), abdominal pain 20 (26%), pallor 17 (22%) and diarrhea 14 (18.2%) in patients. The weight loss, abdominal pain and diarrhea was found significant (p<0.005), while pallor was not significant. The Anti- TTG IgA 94.11% and Anti-TTG IgG 5.89% was positive in Type I DM patients. ***Conclusion:*** Serological evidence of CD is present in patients at the time of diagnosis of Type 1 DM. Thus, screening for CD must be part of the standard of care for every newly diagnosed diabetic patient.

Keywords: Type I Diabetes mellitus, Celiac Disease, Serological tests.

INTRODUCTION

Celiac Disease (CD) and Type I Diabetes Mellitus (DM) are autoimmune and common in children. They share the same Human Leukocyte Antigen (HLA) for genetic transmission on chromosome 6. HLA-DQ8 and HLA-DQ2 primarily emerged as the primary shared genetic distribution. The detection reliably diagnoses Celiac disease instead of invasive procedures such as intestinal biopsy. The diagnosis can be pin-pointed by presence of HLA-DQ2.5.1 non-HLA association with CD and Type I DM has also been recorded.2 Non-HLA gene polymorphisms, such as those in PTPN22, INS, and MSH5, contributes the shared susceptibility and distinguish between Type1 Diabetes mellitus alone and Type1 Diabetes mellitus with Celiac disease.3 The relationship between type I DM and CD is well known, and the prevalence of biopsy proven CD has been reported to be 6.4%.4

Earlier European Society for Pediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN) guidelines and British Society of Pediatric Gastroenterology, Hepatology, and Nutrition (BSPGHAN) made similar recommendations for the diagnosis of CD. The children with TTG antibody level greater than three times the upper limit of normal should have a small bowel biopsy with high risk for CD who are asymptomatic. Later on, ESPGHAN guidelines revealed a no-biopsy approach and testing for HLA-DQ in the screening process. Currently HLA-DQ is not recommended because it is not a cost-effective strategy. A recent study on high anti-TTG IgA and positive Endomysial antibodies (EmA) in patients with type1 DM confirms that high levels over 10 times the upper limit of normal are consistent with histological evidence of CD, whereas lower levels are less consistent.5 In screening of cases with IgA deficit, immunoglobulin G (IgG) antibody and anti-TTG IgG assays are used.6 The advantage of Deamidated gliadin peptides DGP IgG, anti-TTG IgA, anti-TTG IgG and EmA assay helps in diagnosis of asymptomatic and potential CD cases beside typical and atypical varieties of CD.7

Timely diagnosis of CD patients is important in preventing and mitigating the long-term complications such as growth retardation, infertility, osteopenia and malignancies associated with untreated disease. Early diagnosis of CD in association with Type I DM has been reported to improve patient's clinical parameters such as weight, serum ferritin, and has positive impact on quality of life.8 The present study was designed to see the association of CD with Type I DM. The study will help in early diagnosis and prevention of disease complications.

MATERIALS AND METHODS

This cross-sectional study was conducted in Endocrinology and Diabetes Department of Federal Government Polyclinic Hospital Islamabad from 28 Oct 2024 to 28 April 2025. The objective was be to determine the association of Celiac disease in Type I Diabetes mellitus patients. The sample size was calculated by formula (n= Z2 x P (1-P)/ E2), where P=5.1, confidence interval 95% and estimated margin of error 5%. The sample size calculated was 77. The purposive sampling technique was used and patients enrolled through outpatient departments, who met the inclusion criteria. The inclusion criteria were all patients who gave the informed consent to be included in the study trial and diagnosed cases of Type I DM. The exclusion criteria were Patients suffering from Type II DM and malabsorptive disorder.

The study was started after the approval of Institutional Reviewer Board (IRB) No. FGPC. 1/12/2024/E-Committee meeting held on 17-10-2024. The demographic profile, clinical history and laboratory findings were recorded on prescribed proforma. Patients' HbA1c, fasting blood sugar, Anti- TTG (IgA), serum IgA and TTG (IgG) recorded. The HbA1c tests interpreted as normal < 5.7%, pre-diabetic 5.7-6.4% and diabetic > 6.5%. The fasting blood sugar interpreted as normal < 100 mg/dl (5.6 mmol/l), pre-diabetic 100-125 mg/dl (5.6-6.9 mmol/l and diabetes > 126 mg/dl (7.0mmol/l). The normal values of Anti -TTG (IgA) was < 20 U/ml, values above it considered as positive. The normal value of Serum IgA ranges from 70-400 mg/dl in adults, while in children 20-300 mg/dl. Serum TTG (IgG) needed when there was IgA deficiency.

Data was analyzed by SPSS version 26. Quantitative variables like age, duration of diabetes, fasting blood sugar, HbA1c level, level of hemoglobin, Serum anti TTG (IgA), serum IgA and serum TTG (IgG) mean value with standard deviation recorded. Frequency distribution with percentage calculate the qualitative variables like gender, weight loss, abdominal pain and diarrhea. The Pearson test was used to find out the correlation of diabetes mellitus with Celiac disease. The Chi square test was used to find the significance of different variables. The p value less than 0.5 was considered significant.

RESULTS

This study was conducted at Department of Endocrinology And Diabetes in Federal Government Polyclinic Hospital Islamabad. There were 77 patients. The mean age was 21± 9.4 years. The majority of the patients 69 (89.6%) were below the age of 30 years. The male patients were 43(55.8%), while female 34 (44.2%). The mean duration of diabetes mellitus is 9.4 ± 8.1 years. The range of diabetes mellitus duration among study participants were from 1- 34 years. The majority of patients 41 (53.2%) had duration of diabetes span around 7 years. The clinical picture reveals weight loss in 42(54.5%) followed by abdominal pain 20(26%) and diarrhea 14(18.2%) without any significance.

Among the study participants only 3 (3.9%) patients had fasting blood sugar < 100 mg/dl, while 47 (61%) had blood sugar 200 mg/dl equal or more. The majority of the patients 76 (98.7%) had raised HbA1c. The mean HbA1c was 9.5 ± 2.0%. The mode was 7.0%. The mean hemoglobin was 11.34 ± 2.02 mg/dl. The 17(22.1%) patients had hemoglobin level < 10 mg/dl. The serum level of anti TTG (IgA) was positive in 16 (20.8%), while in one case anti TTG (IgA) was not positive but there was strong suspicion of CD. The serum IgA level was found to be low and anti TTG (IgG) was positive. The exact prevalence was 22%.

Table 1: Demographic profile and Sample Description:

S.No.	Variables		Statistical analysis (n=77)
1	Age		Mean 21±9.24 years Min-Max 4-53 years
2	Gender	Male	43 (55.8%)
		Female	34 (44.2%)
3	Duration of diabetes		Mean 9.46±8.1 years Min-Max 1-34 years
4	Weight loss	Present	42 (54.5%
		Absent	35 (45.5%)
5	Abdominal pain	Present	20 (26%)
		Absent	57 (74%)
6	Diarrhea	Present	14 (18.2%)
		Absent	63(81.8%)
7	Level of fasting blood sugar		Mean 219.80±106.42 mg/dl Min-Max 80-641mg/dl
8	Level of HbA1c		Mean 9.51±2.03 Min-Max 4-15.5
9	Level of Hemoglobin		Mean 11.34± 2.02 mg/dl Min-Max 6.6-15.9 mg/dl
10	Anti TTG (IgA)	Positive	16 (20.8%)
		Negative	61(79.2%)
11	TTG (Ig G)	Positive	1 (1.29%)

Table 2: Clinical Presentation and Significance of Diabetes Mellitus and Celiac Disease

S. No.	Clinical Presentation	Frequency Distribution	Diabetes Mellitus (HbA1c)	Celiac Disease (CD)
1.	Pallor	17	P= 0.693	P=0.255
2.	Abdominal Pain	20	P= 0.189	P= 0.001
3.	Diarrhea	14	P= 0.274	P= 0.001
4.	Weight loss	42	P= 0.549	P=0.003

DISCUSSION

This study concluded that the prevalence of CD in patients with Type 1 diabetes was 22% (based on serology Anti- TTG IgA 94.11% and Anti- IgG 5.89%). Oliveiral DR, et al. revealed that serological screening for antibodies associated with CD is an excellent screening test and that HLA typing, although not the most suitable test to be used as first line in screening for CD, can be a useful tool to exclude the possibility of Type1 DM patients developing CD.9 In another study by Zingone F, et al. demonstrated high sensitivity and specificity of the simultaneous assessment of TTG IgA and Deamidated Gliadin Peptide (DPG) IgG in predicting CD in individuals with a high pretest probability.10 In our study the serological testing for CD done in type I DM patients for early quick diagnosis as evidence by Pop D, et al.11 The prevalence of CD varies worldwide due to dietary gluten exposure, early childhood infections, and differences in screening practices. Some researchers have reported that the occurrence of Type1 DM is rapidly rising in the pediatric age group, with a stated rise of 3% on an annual basis.12,13 In a meta-analysis data from Kingdom of Saudi Arabia showed CD in at risk individuals with seropositivity were 15.6%, while both seropositive and biopsy-proven (10.6%).14 In another meta analysis it was revealed that in type I DM patients seropositive Celiac disease prevalence was 9%.15

In our study the mean age was 21±9.24 years. There were 43(55.8%) male, while 34(44.2%) female. The male to female ratio was 1.26: 1. A study by Mehmood N et al had mean age 15.8+ 5.7 years with 40 (58.8%) male and 28 (41.2%) female (M:F= 1.4: 1).16 In a multicentric trial the mean age was 39.8±13.5 year with female dominance of 68.7%.2 In a Nijerian study by Senbanjo IO, et al the mean age was 12.3±4.1 years.

There were 41(41.8%) male and 57 (58.2%) female (M:F= 1:1.5).17 The varying difference is due to varying profile of the world and different study settings. It was observed that in Nigeria half of the population is below 19 year old. The mean duration of DM in our study was 9.46±8.1 years and HbA1c level 9.51+ 2.03. Unal E, et al. at Turkey the frequency of positive serology for CD was 103 (15.4%) in a cohort of 668. The duration of Diabetes mellitus was 3.12 (CI:0.25-16.33) years. The mean HbA1c was 9.45% + 2.06.18 Jaffar M et al in his study showed median duration of Type I DM was 2 year and HbA1c level was more than 7.5% in 67 (68.4%) patients.19

The Oslo definition of CD classified as typical (Intestinal manifestation), atypical (with extra intestinal manifestation), asymptomatic (Sero-positive & villous atrophy), potential (Characteristic HLA, seropositive but lacking intestinal manifestations) and refractory (Resistant to treatment).20 In our study of type 1 DM patient with typical and atypical manifestations of CD were weight loss 42 (54.5%), abdominal pain 20 (26%), pallor 17 (22%) and diarrhea 14 (18.2%). The weight loss, abdominal pain and diarrhea was found significant ($p<0.005$), while pallor was not significant. In a study conducted by Dehbozorgi M, et al. the clinical presentation like chronic abdominal pain in 86 (66.2%) p=0.726 and diarroea in 24 (18.5%) p= 0.003.

Type 1 diabetes mellitus found in 20 (15.4%) p= 0.697. The most common associated co-morbidities with CD are type 1 diabetes mellitus and hypothyroidism.21 In another study by Lal SB, et al abdominal pain in 64.2%, and diarrhoea in 58.2%.22 The differences in clinical manifestations is due to complex interplay of genetics, immunologic, environmental and different study designs. The estimated global prevalence of CD alone is 1% (range 0.7–1.4%).23 Our study and literature review revealed prevalence of CD among type I DM patient is high. The serological testing of type I DM in high clinical suspect cases should be performed with frequent intervals for diagnostic purpose and every 3–6 months for the first year after diagnosis and then every 1–2 years for surveillance of disease.20

This study has certain limitations, including its single center design and relatively small sample size, which may restrict the generalizability of the findings. The cross sectional nature also limits the ability to establish temporal or causal relationships between Type 1 DM and CD. The other autoimmune diseases like Thyroiditis, Rheumatoid arthritis, Autoimmune gastritis and Vitiligo in association with type I DM and CD were not the part of study. New studies assessing nutritional status, Body mass Index (BMI), varying clinical presentations suspecting autoimmune disease should be considered for early detection of CD.

CONCLUSION

Serological evidence of CD is present in a high percentage of children at the time of diagnosis of Type 1 DM. Thus, screening for CD must be part of the standard of care for every newly diagnosed diabetic child. The clinical presentation like abdominal pain, diarrhea and weight loss in type I DM patient should be suspected for CD.

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REFERENCES

1. Alam M, Tipu HN, Ahmad D, Hussain M, Khalid UB. HLA-DQ2 and HLA-DQ8 Alleles in Celiac Disease Patients and Healthy Controls. J Coll Physicians Surg Pak 2022; 32(02):157-160.
2. Al-Anzi MA, Alharbi MG, Alshalan MMT, Alshammari BJI, Aldayal ASA, Aladhyani FHA, et al. Celiac Disease and Type 1 Diabetes in Families: A Systematic Review of Genetic Association. SMHJ [Internet]. 2025;6(1):96-105. DOI:10.54293/smhj.v6i1.179
3. Smyth DJ, Plagnol V, Walker NM, Cooper JD, Downes K, Yang JHM. N Engl J Med 2008;359:2767-77.
4. Awais, M., Rasheed, A.S., Saleem, M.U. (2023). The association between type 1 diabetes and celiac disease in children. Biol. Clin. Sci. Res. J., 2023: 350. DOI.10.54112/bcsrj.v2023i1.350
5. Holmes, G.; Gillett, P. The Implications of Type 1 Diabetes Mellitus Associated with Celiac Disease. J. Clin. Med. 2025, 14, 5129. DOI.10.3390/ jcm14145129.
6. Mahmud FH, Elbarbary NS, Frohlich-Reiterer E, Holl RW, Kordonouri O, Knip M, et al. ISPAD Clinical Practice Consensus Guidelines 2018: Other complications and associated conditions in children and adolescents with type 1 diabetes. Pediatr Diabetes. 2018;19:275-86.
7. Husby S, Koletzko S, Korponay-Szabó, I, Kurppa K, Mearin ML, Ribes-Koninckx C, et al. European Society Paediatric Gastroenterology, Hepatology and Nutrition Guidelines for Diagnosing Coeliac Disease 2020. J. Pediatr. Gastroenterol. Nutr. 2020, 70, 141–156.
8. Chranioti I, Vartzelis G, Maritsi D, Tsolia M. A Co-diagnosis of Crohn Disease and Autoimmune Diabetes in an Adolescent Patient. Case Report: Gastroenterology: Inflammatory Bowel Disease. JPGN Reports. 2022; 3:4(e265). DOI: 10.1097/PG9.0000000000000265
9. Oliveira1 DR, Rebelo JF, Maximiano C, Gomes MM, Martins V, Meireles C, et al. HLA DQ2/DQ8 haplotypes and anti-transglutaminase antibodies as Celiac disease markers in a pediatric population with type 1 diabetes mellitus. Arch Endocrinol

Metab. 2022; 66/2. DOI: 10.20945/2359-3997000000457

10. Zingone F, Norman GL, Smecuol E, Manieroa D, Carroccio A, Biagi F. Utilizing both IgA tissue transglutaminase and IgG-Deamidated Gliadin peptide antibodies offers accurate Celiac disease diagnosis without duodenal biopsy. Digestive and Liver Disease. 2025; 57: 609–615. https://doi.org/10.1016/j.dld.2024.10.010
11. Pop D, Ichim E.G, Farcau D. Nutritional status in children with Celiac Disease and Type1 Diabetes Mellitus- A Narrative Review. Nutrients 2025, 17, 728. doi.org/10.3390/nu17040728
12. Pasi R, Ravi KS. Type 1 Diabetes Mellitus in Pediatric Age Group: A Rising Endemic. Journal of Family Medicine and Primary Care. 2022; 11(1): 27-31. doi: 10.4103/jfmpc.jfmpc_975_21.
13. Niechciał E, Michalak M, Skowrońska B, Fichna P. Increasing Trend of Childhood Type 1 Diabetes Incidence: 20-Year Observation from Greater Poland Province, Poland. Acta Diabetologica.2024; 61(12): 1609-17. doi: 10.1007/s00592-024-02339-5
14. Safi MA, Celiac disease among at-risk individuals in Saudi Arabia Saudi Med J 2019; 40 (1): 9-18 doi: 10.15537/smj.2019.1.23892
15. Karimzadhagh S, Abbaspour E, Shahriarinamin M, Shamsi P, Poursadrolah S, Khorasani M, et al. Meta-Analysis: Global Prevalence of Celiac Disease in Type 1 Diabetes. Aliment. Pharmacol. Ther. 2025; 61: 8–3.
16. Mahmood N, Malik U, Hameed M, Firdous S, Masood S, Munir S. et. al. Presence of Celiac Disease in Type 1 Diabetic Patients Presenting at Jinnah Hospital, Lahore. Annals. 2017; 23(3): 307-11.
17. Senbanjo IO, Abolurin OO , Adekoya AO , Akinola IJ , Anyabolu CH , Adeniyi OF, et al. Celiac disease autoimmunity among Nigerian children and adolescents with type 1 diabetes mellitus. BMC Gastroenterology. 2024. 24:400. doi.org/10.1186/s12876-024-03491-6
18. Unal E, Demiral M, Baysal B, Agın M, Devecioglu EG, Demirbilek H, et al. Frequency of Celiac Disease and spontaneous normalization rate of Celiac serology in children and adolescent patients with Type 1 Diabetes. J Clin Res Pediatr Endocrinol. 2021;13(1):72-79. DOI: 10.4274/jcrpe.galenos.2020.2020.0108
19. Jaffar M, Qazi N, Saleem M, Fatima M, Iqbal M, Jabeen F. Celiac Disease Among Patients with Type 1 Diabetes Mellitus: Celiac Disease and Type 1 Diabetes Mellitus. Pakistan Journal of Health Sciences. 2025; 6(9): 09–14. doi.10.54393/pjhs.v6i9.2625
20. Ludvigsson JF, Leffler DA, Bai JC, Biagi F, Fasano A, Green PH. et al. The Oslo definitions for Celiac disease and related terms. Gut 2013; 62: 43–52.
21. Dehbozorgi M, Honar N, Ekramzadeh M, Saki F. Clinical manifestations and associated disorders in children with Celiac disease in southern Iran. BMC Pediatrics, 2020; 20:256. doi.10.1186/s12887-020-02162-1
22. Lal SB, Venkatesh V, Aneja A, Seetharaman K, Kumar Y, Prasad KK, et al. Clinical spectrum & hanging presentation of celiac disease in Indian children. Indian J Med Res. 2023; 158: 75-84 DOI: 10.4103/ijmr.ijmr-1102-21
23. Amakye D, Clarke K. Celiac Disease: A comprehensive review of epidemiology, pathogenesis, and therapeutic strategies. Digestive Diseases and Sciences. 2026. DOI.10.1007/s10620-026-09860-3.