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Celiac Disease and its Association with Socio-Demographic Parameters in Patients with Diabetes Mellitus Type-1

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ABSTRACT

Objective: To determine the frequency of Celiac disease in patients with Type-1 Diabetes Mellitus (DM) and its association with socio-demographic parameters.

Study Design: Cross-sectional study.

Place and Duration: Medical Departments of Dr Ruth K. M. Pfau, Civil Hospital, Karachi Pakistan, from Apr to Sep 2019.

Methodology: Patients diagnosed with type-1 DM were enrolled in the study. Patients underwent blood testing for Celiac Serology. IgA level greater than 10U/m1 was taken as positive for celiac disease. If IgA levels were low, then Anti-tTG IgG was tested.

Results: One hundred seventy-seven patients diagnosed with type-1 diabetes mellitus were included in this study. The average age of patients was 36.39±6.81 years. There were 109(61.58%) males and 68(38.2%) females. The frequency of celiac disease in patients with type-1 DM was observed at 8.47%. The frequency of celiac disease was not statistically significant among different age groups (p=0.644), gender and disease duration (p>0.05). However, celiac disease was more frequent in patients with a family history, but it was not statistically significant (25% vs 7.7%; p=0.086).

Conclusion: This study showed a higher frequency of celiac disease in patients with T1DM than in the general population in our country, and the data lend support to recommend regular screening for Celiac disease in all patients with Type-1 DM.

Keywords: Celiac disease; IgA level; Type 1 Diabetes Mellitus.

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INTRODUCTION

Type 1 diabetes mellitus (T1DM) is an immune-mediated disease characterized by the loss of the insulin-producing beta cells of the islets of Langerhans in the pancreas, leading to insulin deficiency.[1] The incidence of T1DM, especially in childhood, has rapidly grown during the 20th Century. At the beginning of the third millennium, its prevalence in the general population has been evaluated to be approximately 2-3%.[2] Owing to a common genetic background and the interplay between environmental and immunological factors, patients with T1DM are at high risk of developing other autoimmune disorders. 15-30% of patients with T1DM display Hashimoto's thyroiditis,[3] whereas a small percentage (0.5%) develop Addison's disease. The most frequent autoimmune disorder diagnosed in T1DM patients after autoimmune thyroiditis is celiac disease (CD).[4,5]

Celiac disease (CD) is one of the most frequent autoimmune disorders in Type-1 diabetes mellitus (T1DM). The prevalence of CD in T1DM varies from 3 to 16%, with a mean prevalence of 8%. T1DM and CD show the same genetic background and an abnormal small intestinal immune response with inflammation and a variable grade of enteropathy.[6,7]

In one study, an association between CD and type 1 diabetes mellitus has been recognized for more than 40 years. European studies in diabetic populations have estimated the prevalence of CD to be 1.5% to 4.6% in children and 2% to 4.1% in adults, significantly higher than the estimated 0.5% to 1% overall prevalence of CD observed in the general population.[8,9] CD and type 1 diabetes are associated with the major histocompatibility complex class II antigen DQ2 encoded by the alleles DQA1*501 and DQB1*201, thus providing a common genetic basis for the expression of both diseases.[10] This study aims to see the frequency of celiac disease in patients with type-1 Diabetes mellitus. We want to know about the current magnitude. If the frequency is higher, strategies could be made for early diagnosis, and prompt treatment may lessen the adverse effects and complications.

METHODOLOGY

The cross-sectional study was conducted from April to September 2019 in all the Medical Departments of Dr Ruth K. M. Pfau, Civil Hospital, Karachi Pakistan. The Ethical Board Committee approved the

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study prior to initiation. By taking the prevalence of celiac disease in type-1 Diabetes mellitus i.e. 8%, sample size was calculated. The non-probability consecutive sampling technique was used to enrol participants in the study.

Inclusion Criteria: All the patients, both males and females aged 18 to 45 years, who were already diagnosed with Type-1 Diabetes mellitus were included in the study.

Exclusion Criteria: Patients of chronic renal failure, NSAIDs induced or structural renal disease were excluded from the study.

Informed consent was taken from each participant after explaining the purpose, and confidentiality was assured before the study.

Data were analyzed using the Statistical Package for the social sciences (SPSS) version 23:00. Mean and standard deviation were calculated for age and disease duration. In addition, frequency and percentage were calculated for gender, family history of celiac disease, socioeconomic and educational status and celiac disease. The Chi-square test was applied to find out the association. The *p*-value lower than or up to 0.05 was considered as significant.

RESULTS

One hundred seventy-seven patients diagnosed with type-1 diabetes mellitus were included in this study. The average age and duration of DM were 36.39 ±6.81 years, and 11.96±3.40 years, respectively. There were 109(61.58%) males and 68(38.2%) females. A family history of celiac disease was observed in 8(4.52%) patients. The demographic details were shown Table-I.

Table-I: Patient Characteristics enrolled in the Study (n=177)

Characteristics	n(%)
Age (years) (Mean±SD)	36.39±6.81
Gender	
Male	68(38.42%)
Female	109(61.68%)
Monthly Salary	
<20,000 Rs	4(2.26%)
21,000-50,000 Rs	105(59.32%)
>50,000 Rs	68(38.42%)
Level of Education	
Illiterate	72(40.68%)
Primary	31(17.51%)
Middle	1(0.56%)
Secondary	10(5.65%)
Intermediate	27(15.25%)
Graduate and above	36(20.34%)

The frequency of celiac disease in patients with type-1 diabetes mellitus was observed at 8.47% (15/177). The frequency of celiac disease was not statistically significant among different age groups (p= 0.644). Celiac disease was also not significantly associated with gender and disease duration (p>0.05). However, celiac disease was more frequent in patients who had a family history of celiac disease but it was not statistically significant (25% vs. 7.7%; p=0.086) as shown in Table-II.

Table-II: Association of Celiac Disease with Socio-Demographic and Clinical Characteristics of Patients (n=177)

Characteristics	Celiac Disease		Total	*p*-value
	Yes	No		
Age Groups				
<31 Years	3(6.8%)	41(93.2%)	44	0.644
31 to 40 Years	5(7.1%)	65(92.9%)	70	
>40 Years	7(11.1%)	56(88.9%)	63	
Gender				
Male	9(8.3%)	100(91.7%)	109	0.895
Female	6(8.8%)	62(91.2%)	68	
Duration of Disease				
≤12 Years	10(9.2%)	99(90.8%)	109	0.672
>12 Years	5(7.4%)	63(92.6%)	68	
Family History of Celiac Disease				
Yes	2(25%)	6(75%)	8	0.086
No	13(7.7%)	156(92.3%)	169	
Monthly Salary				
<20 ,000 Rs	1(25%)	3(75%)	4	0.183
21,000to50,000 Rs	11(10.5%)	94(89.5%)	105	
>50,000 Rs	3(4.4%)	65(95.6%)	68	
Education				
Illiterate	6(8.3%)	66(91.7%)	72	0.42
Primary	5(16.1%)	26(83.9%)	31	
Middle	0(0%)	1(100%)	1	
Matric	1(10%)	9(90%)	10	
Intermediate	0(0%)	27(100%)	27	
Graduate & above	3(8.3%)	33(91.7%)	36	

DISCUSSION

Type-1 diabetes mellitus (T1DM) is a chronic autoimmune disorder with varying degrees of insulin deficiency resulting from immune-mediated destruction of pancreatic β-cells, usually present in young individuals.[9] T1DM can be associated with other clinical, subclinical, or potential organspecific autoimmune diseases. Celiac disease (CD) is an autoimmune enteropathy induced by gluten proteins present in wheat, barley, and rye; and characterized by small intestinal lesions of variable severity.[10] The CD shows symptoms and signs of intestinal malabsorption in its classic form. However, the disease may occur in a silent or latent form.[11] The co-existence of T1DM and CD was first suspected in 1954.[12] The same 'susceptibility genotypes' are involved in the aetiopathogenesis of diabetes mellitus and CD. In both diseases,

genetic susceptibility is associated with the HLA-DQ α1*0501, β1*0201 heterodimer, which preferentially presents gluten-derived gliadin peptides on it antigen-presenting groove to stimulate intestinal mucosal T cells.[13] With the identical gene location in both diseases, CD seems more frequent in patients with T1DM than in the general population. In this study, to determine the frequency of celiac in patients with type-1 Diabetes Mellitus, 177 male and female patients with age disease ranging from 18 years to 45 years diagnosed with type-1 diabetes mellitus were included. The incidence of type 1 diabetes reaches a peak at puberty and declines rapidly thereafter.

In our study, the average age and duration of DM were 36.39±6.81 years and 11.96±3.40 years, respectively. There were 109(61.58%) male and 68(38.2%) female. It is often assumed that there is little or no sex bias within either Type-I (insulin-dependent) or Type II (non-insulin-dependent) diabetes mellitus. Clear male preponderance has emerged from most studies of patients with type-1 diabetes diagnosed at 15–40 years. Type I diabetes is the only major organ-specific autoimmune disorder not to show a strong female bias.[14]

Less than 10% of patients with T1DM and CD show gastrointestinal symptoms.[15] Therefore, most professional societies recommend screening patients with T1DM for CD. However, there has yet to be a consensus regarding the recommended screening tests and the frequency of screening.[16] Studies published during the last few years have demonstrated elevated prevalence rates of CD among individuals with T1DM: 4.4% in the United Kingdom, 3.7% in Israel, 4.8% in Greece, and 6.4% in Germany, and as high as 10.5% in Brazil and 11.1% in India.[17,18] In our study, the frequency of celiac disease in patients with type-1 diabetes mellitus was observed in 8.47% (15/177). Recent studies reveal 1-8% of people with type-1 diabetes have CD. Some studies suggest CD was 20 times more frequent in type-1 diabetics.[18,19] A previous study conducted found CD prevalence in adult type-1 diabetes at 6%.[20] It is well known that clinical CD represents only the tip of the iceberg. Subclinical disease is not infrequent in the general population, and serological tests such as IgA level can be used to identify these asymptomatic individuals. This study took an IgA level greater than 10U/m^1 as positive for celiac disease. This is important because treating asymptomatic patients with T1DM with a gluten-free diet positively affects glycemic control and growth. Furthermore, it can prevent osteoporosis and the development of autoimmune diseases.[18]

CONCLUSION

This study showed a higher frequency of CD in patients with T1DM than in the general population in our country. Data lend support to recommend regular screening for CD in all patients with T1DM for timely diagnosis and to avoid complications.

Conflict of Interest: None.

Author's Contribution

Following authors have made substantial contributions to the manuscript as under:

PI & SFQ: Study design, drafting the manuscript, data interpretation, critical review, approval of the final version to be published.

SL & MY: Data acquisition, data analysis, critical review, approval of the final version to be published.

SAS & SM: Conception, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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