Suez Canal University Medical Journal Vol. 27 (2), 2024
Pages 1-7

Helicobacter Pylori in Children with Type 1 Diabetes Mellitus and its Relationship with Glycemic Control and Gastrointestinal Manifestations

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Abstract

Background: **Children with Diabetes Mellitus (DM) can get different infections because of things like immune system problems, problems with how the stomach moves, more trips to the hospital, and stomach problems. It seems likely that (H. pylori) infection causes some of these stomach problems.** ***Aim:*** **The goal of this research is to improve the outcome of patients with type 1 DM.** ***Objectives:*** **Determine the prevalence of H. pylori in children with T1DM and look at how H. pylori infection is related to glycemic control and GI symptoms.** ***Patients and Methods:*** **This study was done as a critical cross-sectional study and included 180 children diagnosed with type 1 DM attending the pediatric Department at Suez Canal University Hospital. Each child was subjected to complete history taking, complete examination, glycated hemoglobin (HbA1c), and H. pylori stool antigen.** ***Results:*** **The frequency of H. Pylori among studied diabetic cases was 27.8%. Children with H. pylori infection had significantly higher ages than children with negative H. pylori infection (p=0.02). HbA1c was significantly increased in positive cases than in negative cases. (p =0.001).** ***Conclusion:*** **H. pylori is more likely to spread to children with diabetes. Also, infections caused by aggressive strains tend to happen to people who are older and have a higher HbA1c. So, people with diabetes who don't have good glucose control should get tested for H. pylori.**

Keywords: *Children, Diabetes Mellitus, Helicobacter Pylori.*

Introduction

The autoimmune response causes (T1D). attacks the pancreas β-cell and makes less insulin. Each year, more people around the world get this sickness(1). Helicobacter pylori has been linked to multiple gastrointestinal disorders(2). Helicobacter pylori (H. pylori) is a common human pathogen. Chronic gastritis, peptic ulcer disease, gastric cancer, and gastric mucosa-associated lymphoid tissue lymphoma are among the diseases that can result from a prolonged H. pylori infection. H. pylori infections are 1.3 times more common in patients with diabetes than in those without the dis-

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ease[3]. The link between Helicobacter pylori (H. pylori) illness and diabetes mellitus (DM) is not clear. Some studies show that there are a lot of people with type 1 or type 2 DM who are infected with H. pylori. Diabetes changes both humoral and cellular immunity because of a weakened immune response, and the fact that many diabetics have upper GI complaints has led some to think that H. pylori may be linked to diabetes[4]. Chen et al.[5] did a large-scale cross-sectional study and found that H. pylori seropositivity was linked to higher levels of glycosylated hemoglobin (HbA1c). This showed that H. pylori may be a cause of adults' poor glucose tolerance. Lu et al.[6] found that H. pylori-negative T1DM patients had much higher insulin levels during fasting and after a meal than their H. pylori-positive peers. This meta-analysis was conducted by a different team to investigate the link between H. pylori and diabetics' ability to maintain healthy blood sugar levels. HbA1C levels were not greater in H. pylori carriers than in non-carriers, the study found[7]. The research set out to determine whether H. pylori infection had any bearing on glucose control or gastrointestinal symptoms in children with type 1 diabetes mellitus.

Patients and Methods

Patients

This cross-sectional study was conducted on one hundred and eighty children with type 1 Diabetes who attended the diabetic outpatient clinic in the pediatric department at Suez Canal University Hospital from December 2019 to December 2021. Children aged 12- 18 years old, of both genders were included. Diabetic children with other chronic diseases as; congenital heart disease and other endocrinal diseases and Children who have been on or used medicine to get rid of H. pylori in the last two months were excluded.

Methods

Personal and medical history: Name, age, address, history of diabetes as; age of onset, type of the received insulin and its dose and gastrointestinal symptoms as; nausea, dyspepsia, and heartburn.

General examination: BP and anthropometric measures (height, weight, & body mass index)

Laboratory investigations: 1) HbA1c: HbA1c Quantitative Test by HbA1c plus tests on semi- automated chemistry analyser. 2) H. pylori antigen in stool: by H. Pylori Ag Rapid Tests.Test is lateral flow chromatographic immun assay.

Ethical Considerations

Informed consent was taken from each child's parent or guardian before taking any data or doing any intervention and approved from Ethical committee of Suez Canal Universty.

Statistical Analysis

Following the loading of the data into the computer, an analysis of the data was carried out with the assistance of the IBM SPSS software package, version 22.0. The description of the qualitative facts included the use of numbers and percentages. The median, the minimum, and the maximum were employed to characterize the data when it was not possible to apply a parametric model. The mean, the standard deviation, and the Kolmogorov-Smirnov test were utilized to provide a comprehensive description of the parametric data. At the level of significance (0.05), the results were regarded as being important. For qualitative data, when comparing two or more groups, the Chi-Square test is the method of choice. When

more than twenty-five percent of the cells in a table have a count that is lower than five, statisticians turn to the Monte Carlo test as a means of refining the Chi-Square test. When there was a problem with the Chi-Square test caused by the presence of more than 25% of cells in 2*2 tables with counts of less than 5, the exact test was utilized to fix the problem. Regarding quantitative data between groups, Parametric tests such as Student t-test were utilized to make a comparison between the two distinct groups. The Mann-Whitney test is an example of a nonparametric statistic Two different groups were compared using the U test.

Results

This cross-sectional study was carried out on 180 diabetic children whose ages ranged from 12 to 18 years with a mean HA1C of 9.01 (4.3 to 15.5 %.). Figure (1) illustrates that the frequency of H. Pylori among studied diabetic cases was 27.8% was +ve and 72.2% was -ve.

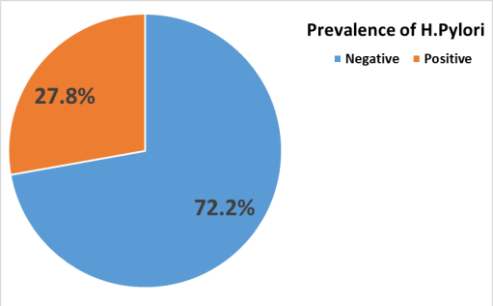

Figure 1: Frequency of H. pylori among studied diabetic patients

Table 1: Association between socio-demographic characteristics and H. pylori among studied diabetic patients

	H. pylori		test of significance
	-ve n=130	+ve n=50	
Age (years) mean±SD	14.16±1.96	14.94±1.99	t=2.35 p=0.02*
Gender n (%)			
Male	66 (50.8)	28 (56.0)	χ^2=0.39
Female	64 (49.2)	22 (44.0)	p=0.53

Table (1) shows that the average age of diabetic patients with H pylori infection was statistically significantly higher than the average age of diabetic patients without H pylori infection (14.94±1.96 vs. 14.16±1.96). This shows that there is a statistically insignificant link between H pylori infection and studied diabetic cases. Table (2) illustrates that diabetic patients with no H pylori infection had statistically significant higher mean weight and height than cases with H. Pylori infection. However, there was no significant difference regarding their body mass index. Table (3) shows that there is a statistically significant higher mean HBA1C among diabetic patients with H pylori infection than negative cases (10.25 ±1.60 & 8.53±1.75, respectively). The mean age of diabetes onset was not significantly associated with H.

Pylori infection among studied cases. Table 4 shows that people with diabetes who have an H. Pylori infection are statistically more likely to have stomach problems like heartburn (42%), feeling sick (38%), and throwing up (36%). A statistically significant association was found between glycemic control & H. Pylori infection among studied cases with 75.5 % of the cases with negative H. pylori infection having poor glycemic control versus 86% of cases with positive H. pylori infection. Fair glycemic control among (-ve) cases was 24% and between (+ve) cases 14% with an odds ratio of 5.41 (Table 5).

Discussion

Type 1 diabetes (T1D) is an inflammatory disease that usually affects people when they are young, but it can happen to almost anyone at any age. It is caused by T cells that attack their kind and kill beta cells in the pancreas that make insulin. Epidemiological research showed that the number of cases is going up by 2%–5% each year around the world[9]. H. pylori-caused gastritis is characterized by an increase in the number of inflammatory cells, which is usually the first sign that something is wrong. Along with damage to the stomach mucosa and some ways for H. pylori to avoid being attacked by the immune system, inflammation is one of the most important things that stop it from spreading[10].

In this study, 27.8% of the diabetic people who were looked at had H. Pylori. In line with what we found, Dooki et al.[11] found that 27% of children with diabetes mellitus were infected with H. pylori. Chobot et al.[12] found that 11.4% of children with type 1 diabetes mellitus had H. pylori in their bodies.

Table 2: Association between body size and H. pylori infection in diabetic people who were studied.

	H. pylori		test of significance
	-ve N= 130	+ve N=50	
Weight (kg)	51.24±13.67	46.61±12.65	t=2.15, p=0.03*
Height (cm)	154.96±12.9	150.5±12.38	t=2.13, p=0.03*
BMI (Kg/m^2)	20.97±3.01	20.18±2.86	t=1.62, p=0.11

*t: Student t test * statistically significant χ^2: Chi-Square test*

.Table 3: Association between diabetes characters and H. pylori infection among studied diabetic patients

	H. pylori		test of significance
	-ve n=130	+ve n=50	
Age of onset /yrs.	10.21±2.02	10.24±2.11	t=0.09, p=0.92
Hb A1c	8.53±1.75	10.24 ± 1.60	T= 6.05, P<0.001*

*t: Student t-test * statistically significant*

About how H. Pylori infections are more common in poor countries than in developed ones[13], it was reported that the number was 74%. This difference between developed and poor countries in the number of people who are infected with H. pylori may be due to genetic differences. Good health measures and self-hygiene in developing countries can reduce the possibility of infection also they

are economically better in different modalities as they can use them in research and have advanced methods in treatment and control of diabetes like an insulin pump, this good control of diabetes could decrease the possibility of infection with H. pylori, Also, people with diabetes are more likely to get sick for several reasons .

Table 4: Researchers looked at the relationship between GI symptoms and H. pylori infection in diabetic people.

Symptoms	H. pylori		test of significance
	-ve n=130	+ve n=50	
Heart burn	19 (14.6%)	21 (42%)	χ^2=15.67, p=0.0001*
Colic	21 (16.2%)	14 (28%)	χ^2=3.23, p=0.07
Diarrhea	16 (12.3%)	14 (28%)	χ^2=6.4, p=0.01*
Distension	22 (16.9%)	13 (26%)	χ^2=1.89, p=1.68
Nausea	15 (11.5%)	19 (38%)	χ^2=16.5, p=0.0004*
Vomiting	2 (1.5%)	18 (36%)	χ^2=43.42, p<0.001*
No symptoms	40 (30.7%)	5 (10%)	χ^2=8.3, p<0.003*

*χ^2: Chi-Square test, * statistically significant*

Table 5: Association between diabetic control and H. pylori infection among studied cases.

Glycemic control	H. Pylori		Test significance
	-ve N=130	+ve N=50	
Poor control n(%)	136 (75.5%)	43 (86%)	χ^2= 8.14, P= 0.004*
Fair control n(%)	44 (24%)	7 (14%)	OR=5.41 (1.512-19.35)

*χ2: chi-square test. * Statistically significant (p <0.05)*

These include diabetes-caused changes to cellular and humoral immunity, diabetes-caused changes to gastrointestinal motility and acid secretion that may increase the rate of pathogen colonization and infection in the gut, alterations in glucose metabolism, which may create chemical changes in the gastric mucosa that make it easier for H. pylori to thrive there, as well as the reality that diabetes has a greater probability to be exposed to pathogens than healthy people are because diabetics spend more time in hospitals than healthy people do[14]. The current study showed that HbA1c was much higher in positive cases than in negative cases, and all of the positive cases had poor control of their blood sugar. We agree with this finding. Eisaa et al.[15] found that H. pylori infection is significantly linked to HbA1c level and that HbA1c was significantly higher in the H. pylori-positive group than in the H. pylori-negative group. Some studies have found a link between this illness and HbA1c in people with type 1 diabetes[3,16,17]. Children with diabetes can get hyperglycemia from an infection with H. pylori. The exact causes of this are not known, but it is thought that stress hormones and the production of cytokines are involved. Cytokines can cause counterregulatory hormones to be released, which has a direct effect on carbohydrate metabolism[18]. In this study, participants who tested positive for diabetes were significantly more likely to ex-

perience complications related to the disease than participants who tested negative. Concerning the various forms of difficulties, we discovered that DKA was substantially more common in positive cases than in negative cases. This was the finding that we came to. On the other hand, skin infections, visual issues, toothaches, and tingling in the fingers or toes were more common in those who tested positive for the virus than in people who tested negative, even though the difference was not very big. This can be explained by the fact that an H. pylori infection can cause hyperglycemia in children with diabetes[18]. It was said that H. pylori infections cause damage to the small blood vessels and speed up the development of atherosclerosis[19]. Another study found that there was a strong link between HP-positivity and neuropathy, but not between HP-positivity and blindness[20].

Conclusion

The study concluded that 27.8% of diabetic children have H. Pylori. Also, infections caused by virulent strains are linked to older people, who have a higher BMI and have a higher HbA1c. Poor control of blood sugar is linked to H. pylori.

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