SCREENING OF HELICOBACTER PYLORI INFECTION AMONG CHILDREN WITH TYPE ONE DIABETES MELLITUS

By

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ABSTRACT

Introduction: *H.pylori is considered as the commonest chronic bacterial infection in man, one half of the world's population has helicobacter pylori infection.*

Objectives: *The aim of this study is to investigate the prevalence of H.pylori in diabetic patients and a possible role of the infection in their metabolic control.*

Methods: *This case control study included 50 diabetic pediatric patients (age ranged from 4 to 16 years) complained of gastrointestinal symptoms or unexplained anaemia who presented to pediatric clinic at Sayed Galal University Hospital in the period from October 2020 to April 2021 and had been tested for the presence of H.pylori infection by Stool antigen test.*

Twenty healthy non diabetic children (age and sex matches) were included as controls together with the 50 diabetic pediatric patients, they were screened for H.pylori by the stool antigen test and accordingly classified into H.pylori positive and H.pylori negative in an attempt to compare the two groups and correlate between H.pylori infection with the age, duration of diabetes, clinical and laboratory findings. Both groups were subjected to complete history taking, clinical examination, and lab investigation.

Results: *In the patients group, 63% of patients were males while 36 % were females.*

Regarding the Frequency of H.Pylori infection among patients and controls according to stool antigen test, our study showed a total of 30 positive cases out of 50 (60%) in the diabetic patients compared to 9 positive controls out of 20 (45%). There was no significant statistical difference between prevalence of H.pylori infection in cases and controls (p 0.254).

Conclusion: *In this study no statistically significant difference was found regarding H.pylori positivity between diabetic cases and controls, as 60% of cases were positive compared to 45% of controls.*

Our results showed that H.pylori infection is most frequently detected in individual of low socioeconomic status with insanitary water supplies and overcrowding.

Keywords: *H.pylori, T1DM, Stool Antigen Test.*

INTRODUCTION

H.pylori is considered as the commonest chronic bacterial infection in man, one half of the world's population has helicobacter pylori infection. Prevalence estimates vary greatly depending on the location of the study group and the characteristics of the population studied, in general, prevalence correlates positively with a low socioeconomic status during childhood **(Hooi et al., 2018)**.

H.pylori prevalence ranges between 85% and 95% in developing countries and between 30 and 50% in developed countries, the epidemiology of H.pylori infection has changed with improvements in sanitation and methods of eradication **(Khoder et al., 2019)**.

In Egypt, **Galal and co-workers (2019)** studied the prevalence of H.pylori among symptomatic school children attending the Outpatient Clinics of the Pediatric Hospital, Cairo University and found that the overall prevalence was 64.6%. Residence in rural areas, educational status of mothers (non-educated), household crowding index ≥ 3, absence of pure water supply, and eating from street vendors were significantly associated with H.pylori infection.

AIM OF THE STUDY

The Aim of this study was to:

1. Evaluate the prevalence rate of H.pylori in type 1 diabetic patients with gastrointestinal troubles.
2. Study the correlation of H.pylori with the age, duration of diabetes, clinical and laboratory findings.

Ethical Considerations:

1. Approval of ethical committee in the university was obtained before the study.
2. Full informed consent was taken from parents
3. Any risks during the course of the research were cleared to the participants and to the Ethical Committee on time.
4. Privacy of participants and confidentiality of the data were maintained.
5. The patient has the right to withdraw from the study at any time.
6. The authors declared that there is no conflict of interest or any financial support regarding the study or publication.

PATIENTS AND MATERIALS

This study included 50 diabetic pediatric patients (age ranged from 4 to 16 years) complained of gastrointestinal symptoms, who presented to pediatric clinic at Sayed Galal University Hospital with gastrointestinal complaints and had been tested for the presence of H.pylori infection during period from October 2020 to April 2021 by the stool antigen test.

Twenty healthy non diabetic children (age and sex matches) were included as controls and together with the 50 diabetic pediatric patients were screened for H.pylori by the stool antigen test accordingly classified into H.pylori positive and H.pylori negative in an attempt to compare the two groups and correlate between H.pylori infection with the age, duration of diabetes, clinical and laboratory and findings.

Inclusion Criteria:

1. Age: below l8 years.
2. Diagnosis of diabetes according to **WHO definition (2006)**.
3. Complaining of GIT symptoms as recurrent abdominal pain, Anorexia, Recurrent vomiting or unexplained anaemia.

Exclusion criteria:

1. Children who used antimicrobial therapy or proton pump inhibitors within one month from the study.
2. Cardiovascular. Pulmonary or genitourinary causes of abdominal pain.
3. Anatomic abnormalities.
4. Helminthes infestation or Urinary tract infection.

- **Selected children were subjected to the following:**

A. History:

A careful history was taken from each case including:

1. Personal history:

Name, Age, Sex, Residence, Consanguinity, Number and order between siblings.

2. Present History:

Age of onset, Nature of symptoms: Diarrhea, Vomiting, Anorexia, Recurrent abdominal pain, And Growth failure. Drugs: Antibiotics, antacid, metronidazole and others.

3. Diabetic history:

Age at diagnosis of Diabetes and duration.

Diabetes therapy: Insulin regimen: The insulin regimen followed during the last 2 years at least has been recorded.

4. Past History:

Drug intake e.g. PPI, antacids or antibiotics.

Any significant illness or prev. infection with H.pylori.

5. Family history: history of similar condition

6. Socio-economic status: e.g. patient education, occupation, sanitary status and overcrowding index.

B. Full clinical examination with special emphasis on:

1. Vital signs: Heart rate, respiratory rate, temperature and Blood pressure.

2. Anthropometric measurements: height and weight, Body mass index (BMI) and their percentiles.

3. Systemic examination of chest, abdomen, back and limbs.

C. Investigations:

Lab investigations including:

A. Venous blood samples were taken for:

1. CBC: was done using the Abbot CELL-DYN® 1800 Hematology Analyzer, Abbott Laboratories, USA.

2. HbA1C (%): was measured with affinity column chromatography, (reference values between 4.7 and 6.0%; Pierce Scientific Corp., Rockford, IL, USA) One random blood sugar reading.

B. Urine analysis and culture & sensitivity

C. Stool analysis to exclude helminthes infestation.

D. Stool antigen test.

- **Stool antigen test for diagnosis of H pylori:**

Principle of the test:

- H.pylori Antigen Test System is a solid phase enzyme immunoassay based on sandwich principle for the qualitative and quantitative detection of H.pylori antigen in human stool. The microwell plate is coated with anti-H.pylori antibodies. During testing, the antigens are extracted out with extraction solution and added to the antibodies coated microwell plate with the enzyme-conjugated antibodies to H.pylori and then incubated. If the specimens contain H.pylori antigens, it will bind to the antibodies coated on the microwell plate and simultaneously bind to the conjugate to form immobilized antibody H.pylori antigen conjugate complexes. If the specimens do not contain

H.pylori antigens, the complexes will not be formed. After initial incubation, the microwell plate is washed to remove unbound materials. Substrate A and substrate B are added and then incubated to produce a blue color indicating the amount of H.pylori antigens present in the specimens. Sulfuric acid solution is added to the microwell plate to stop the reaction producing a color change from blue to yellow. The color intensity, which corresponds to the amount of H.pylori antigens present in the specimens, is measured with a microplate reader at 450/630.

Statistical methodology:

The data was encoded in the Microsoft excel sheet and subsequent analysis was done. Statistical analysis was performed using SPSS version 17.0 (SPSS Inc., Chicago, IL). The quantitative data were presented as means ± standard deviation (SD), where appropriate. A p-value of less than 0.05 was accepted as significant and less than 0.001 was considered as highly significant.

Chi-square or Fisher exact test were used to examine the relation between qualitative variables, comparison between two groups was done using independent t student test for continues variables, comparison between three groups was done using ANOVA test.

RESULTS

Our results will be demonstrated in the following tables and figures:

Table (1): Demographic data of the studied groups:

		Diabetic patient (n=50)	Controls (n=20)	P value
Mean age (years) ±SD		11.04 ± 2.97	11.2 ± 2.86	0.27
Age distribution	4-7 years	9 (18.0 %)	3 (15.0 %)	0.955
	8-11 years	19 (38.0 %)	8 (40.0 %)	
	12-16 years	22 (44.0 %)	9 (45.0 %)	
Sex	Male	28 (56.0 %)	11 (55.0 %)	0.939
	Female	22 (44.0 %)	9 (45.0 %)	

This table shows that there was no significant difference between the two groups regarding age and sex.

Table (2): Frequency of H.pylori infection among patients and controls according to stool antigen test

	Diabetic patient (n=50) No. (%)	**Controls (n=20)** No. (%)	**P value**
Positive	30 (60.0 %)	9 (45.0 %)	0.254
Negative	20 (40.0 %)	11 (55.0 %)	

This table shows that there is no significant difference among both groups as regards the frequency of H.pylori infection.

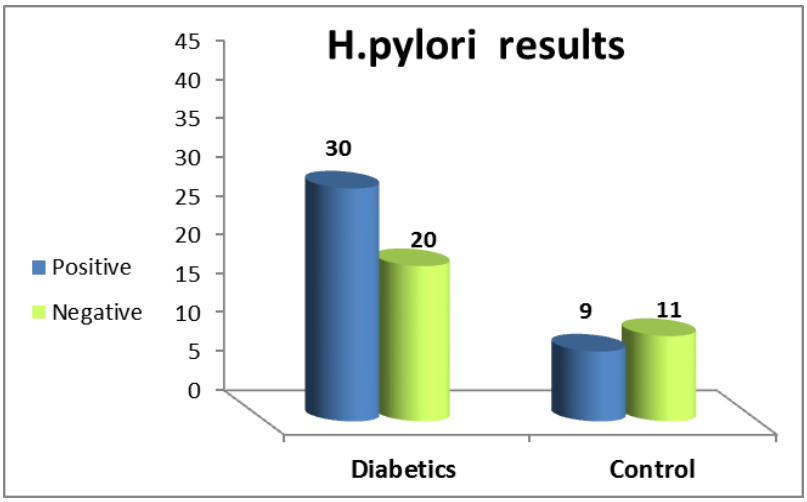

Figure (1): Distribution of H.pylori positive results among cases and controls

Table (3): Age and sex distribution in patients group (diabetic)

	H.pylori results in cases		**P value**
	Positive (n=30) No. (%)	**Negative (n=20)** No. (%)	
4-7 years	3 (10.0 %)	6 (30.0 %)	0.955
8-11 years	11 (36.7 %)	8 (40.0 %)	
12-16 years	16 (53.3 %)	6 (30.0 %)	
Male	19 (63.33 %)	9 (45%)	< 0.005
Female	11 (36.66 %)	11 (55%)	

This table showed that the prevalence of H.pylori in studied cases was 63% in males compared to 36 % in females with statistically significant difference while no significant diffirance regarding age distribution.

Table (4): Risk factors among patients group (Diabetic)

	H.pylori results in cases		**P value** Chi square test
	Positive (n=30) No. (%)	**Negative (n=20) No. (%)**	
Overcrowding. index*(>3/room)	15 (50.0 %)	4 (20.0 %)	0.032*
Maternal illiteracy	14 (46.7 %)	5 (25.0 %)	0.122
Bad feeding habits	16 (53.3 %)	8 (40.0 %)	0.355
Low socioeconomic factors	16 (53.3 %)	8 (40.0 %)	0.355
Positive consanguinity	14 (46.7 %)	10 (50.0 %)	0.817

This table shows that overcrowding was the most significant risk factor for high prevalence of H.pylori infection among studied cases. *(Crowding Index is more than or equal to 3 persons /room).

Table (5): Symptoms and signs in patients group (Diabetic)

	H.pylori results in cases		**P value** Chi square test
	Positive (n=30) No. (%)	**Negative (n=20) No. (%)**	
Abdominal pain	29 (96.7 %)	11 (55.0 %)	<0.001*
Nausea & vomiting	10 (33.0 %)	5 (25.0 %)	0.529
Constipation	4 (13.3 %)	1 (5.0 %)	0.636
Diarrhea	8 (26.7 %)	2 (10.0 %)	0.149
Anemia symptoms e.g. fatigue and headache	23 (76.7 %)	7 (35.0 %)	< 0.005*
Weight loss	21 (70.0 %)	13 (65.0 %)	0.710
Abdominal distention	17 (56.7 %)	9 (45.0 %)	0.419
Abdominal tenderness	9 (30.0 %)	2 (10.0 %)	0.094

This table shows that abd. Pains, symptoms of anaemia were significantly increased in positive cases for H.pylori in diabetic patients.

Table (6): lab results among diabetics patients

	H.pylori results		P value T-test
	Positive (n=30) Mean ± SD	**Negative (n= 20) Mean ± SD**	
Hb(mg/dl)	8.1 ± 0.4	9.1 ± 0.4	<0.001
RBG	228.8 ± 50.3	156.0 ± 42.9	<0.001
HbA1c (%)	8.3 ± 1.2	7.8 ± 1.1	0.318

This table shows significant difference regarding Hb % & RBG between positive and negative H.pylori in diabetic patients.

Table (7): Lab finding in H .pylori positive cases in diabetic group

Test	Results	Number	%	P value
Hb (mg/dl)	≤ 9(anemic)	28	93.3	T-test 0.0301
	> 9mg/dl(normal)	2	6.7	
HbA1C	< 7(good control)	1	3	ANOVA 0.0415
	7-9 (fair control)	22	73.3	
	>9 (poor control)	7	23.7	

This table demonstrates that most patients with H.pylori were anemic with hemoglobin level of ≤9. Similarly, 73% of H.pylori cases had glycosylated hemoglobin of 7-9 indicating fair control and 23% had glycosylated hemoglobin of >9 with poor control.

Correlation of clinical data regarding stool antigen test in diabetic group:

Table (8): Comparison between clinical data and H.pylori in stool

	H.pylori results in cases		P value
	Positive (n=30) No. (%)	Negative (n=20) No. (%)	
Weight for age percentile			
<5th percentile	8 (26.7 %)	1 (5.0 %)	0.051
>5th percentile	22 (73.3 %)	19 (95.0 %)	
Height for age percentile			
<5th percentile	6 (20.0 %)	0 (0%)	0.069
>5th percentile	24 (80.0 %)	20 (100 %)	
Duration of diabetes			
New onset (6m-1year)	7 (23.3 %)	5 (25.0)	0.892
Old onset (>1year)	23 (76.7 %)	15 (75.0)	
Number of insulin injection			
2 doses	10 (33.3 %)	5 (25.0 %)	0.529
≥3 doses	20 (66.7 %)	15 (75.0 %)	
Family history of diabetes			
Positive	8 (26.7 %)	3 (15.0 %)	0.329
Negative	22 (73.3 %)	17 (85.0 %)	

This table shows insignificant difference between both groups regarding clinical data.

DISCUSSION

H.pylori is considered as the commonest chronic bacterial infection in man, one-half of the world's population has helicobacter pylori infection. Prevalence estimates vary greatly depending on the location of the study group and the characteristics of the population studied, in general, prevalence correlates positively with a low socioeconomic status during childhood **(Hooi et al., 2018)**.

H.pylori prevalence ranges between 85% and 95% in developing countries and between 30 and 50% in developed countries, the epidemiology of H.pylori infection has changed with improvements in sanitation and methods of eradication **(Khoder et al., 2019)**.

In children with type 1 diabetes, gastrointestinal symptoms are frequently observed although their prevalence and impact on glycemic control are

poorly defined **(Toporowska et al., 2007)**, delayed gastric emptying and antral dysmotility is now recognized as a major cause of H.pylori colonization in diabetes mellitus **(Huang, 2017)**.

Alteration of glucose metabolism in diabetes has been suggested as, promoting H.pylori colonization **(Buzás et al., 2014)**.

This comprehensive study investigates the prevalence of H.pylori in diabetic patients and a possible role of the infection in their metabolic control. many studies have investigated the prevalence of H.pylori in diabetic patients and a possible role of the infection in their metabolic control with discordant results, some studies did not exhibit a higher prevalence of H.pylori in diabetic patients and did not support any correlation between metabolic control and infection **(Li et al., 2017)**, while others have demonstrated a higher seroprevalence of the infection in diabetic patients and significantly worsens metabolic control in children and adolescents with type 1 diabetes mellitus **(Toporowska, 2007)**.

The overall incidences of H.pylori infection in all children (cases and controls) we have studied were 55 % This Result Is Lower than a study done in Egypt by **Mohammad et al. (2008)** which was 72%, this may be attributed to a difference in the Mean age, it is 11.04 in our study versus 13.5 in Mohammad study.

In the contrary, our result is in agreement with result of **Hasosah et al. (2015)**; who found that the prevalence of H.pylori at age 5-1o years was 57.3 % and 61.2 % at 10-15 years. **Çınar et al. (2015)** investigated the prevalence of H.pylori in Turkish children and revealed that about 49 % at age 3-16 years were infected.

The mean age of the stool antigen test positive patients in our study was 12.1 years while that of the stool antigen negative patients was 9.5 years a difference which was statistically significant.

In our study, the prevalence rate was found to be (33%) in patients 4-8 years of age, (57%) in patients 8 -12 years, (72%) in patients 12 -17 years so the prevalence is ascending as patients age advances, which is comparable with other studies conducted in other geographic areas which also demonstrated that the prevalence of infection steadily increases with age among children and young adults **(Wex et al., 2011)**. A plateau in the prevalence of infection occurs among middle to older age adults

and the prevalence may decrease in old age **(Lee et al., 2016)**.

In our study 63 percent of the stool antigen test positive patients were male while 33 percent were female, a difference which was statistically significant.

This is in agreement with **Klei et al. (2014)**, who studied 105 Peruvian children between 6 & 30 months of age at 6 months interval and found a significant gender difference (males 63.6% - 55%, females 80% - 38.7% P: 003) indicating that during the first 18 months of age male infants were more likely to acquire H.pylori infection and less like1y to clear the infection than the female infants.

H.pylori infection is most frequently detected in individual of low socioeconomic status with insanitary water supplies and overcrowding **(Aitila et al., 2019)**. Many studies suggest that socioeconomic status in childhood may be more important than later in life in acquisition of the infection **(Malaty and Graham, 1994)**.

Regarding risk factors for acquiring H.pylori infection in our patient group according to our specific criteria described in the methodology we found that overcrowding conditions (50%), bad feeding habits (53.3%), illiteracy of mother (46%), low socioeconomic standard (53.3%), positive consanguinity (46.7%) were the most common detected ones.

In the present study, evaluation of socioeconomic status of H.pylori positive and negative cases revealed that the positive group had a lower socioeconomic score represented in overcrowding (50% versus 20% in the positive cases and negative cases respectively).

These results are in agreement with the study done by **Al-Hussaini et al. (2019)** in which significant correlation was found between socioeconomic conditions, household crowding and H.pylori status.

In contrast to our study, Abdullah and co-workers 2020 investigated the prevalence of H.pylori among school children in Zagazig city, they found that there was no statistically significant difference between H.pylori +ve & H.pylori –ve infected children as regarding age, sex, socio economic status the prevalence rate was (52%) in low socioeconomic class in comparison to (54.9%) middle socioeconomic class **(Abdullah et al., 2020)**.

In our study as regard the clinical manifestation of H.pylori,

there was weight loss in 70% of positive cases but little significant effect on the children height and this goes in accordance with a study by **Thomas et al. (2004)** who investigated the effects of H.pylori infection on growth and revealed that newly acquired infection might retard linear growth and weight gain in children during early infancy, although this effect does not persist into later childhood

In one study by **Raymond et al. (2019)**, the most frequently reported symptom was abdominal pain (63.3% of 77 H.pylori-infected cases) and this goes in accordance with our study in which 97 % of our cases were complaining of abdominal pain and a statistically significant correlation was found between H.pylori positivity and recurrent abdominal pain ($p<0.001$).

The presenting clinical manifestations in our study were recurrent upper abdominal pain, 11cases(55%) among 20 negative cases were complaining from abdominal pain, while 96.7 % of positive cases were also complaining of abdominal pain and this was statistically significant which is in agreement with work done by **Nizami et al. (2005)** and **Salah et al. (2006)**.

These results have the same frequency reported by **Rasool et al. (2021)**, who in a trial to determine the prevalence of H.pylori among children with recurrent abdominal pain and found that recurrent abdominal pain affects approximately 10-15% of children and that there was a high prevalence of H.pylori 54% among children with recurrent abdominal pain and that symptoms were effectively and significantly reduced by eradication of H.pylori.

These results were similar to those obtained by **Zangana et al. (2020)** who showed a high prevalence of H.pylori infection (45.7- 50.5%) in children who suffered from recurrent abdominal pain.

Other gastrointestinal manifestation was vomiting (30%), with no difference between negative and positive cases, which is in agreement with **Nizami et al. (2005)** $p=0.529$.

Extra digestive manifestations have been reported during the course of this infection in children such as iron deficiency anemia reported by **Jones et al. (2017)**, **Malfertheiner et al. (2017)** the relation between H.pylori infection, iron absorption and gastric acid secretion with conclusion that iron absorption

and gastric acid secretion were significantly lower in the H.pylori infected children, this agrees with our study as anemic symptoms as pallor and tachycardia was presented in 76.6% of the positive children.

This study demonstrated that almost all patients with H.pylori were anemic with hemoglobin level of ≤9, the mean hemoglobin level was 8.1(SD±0.4) among patients while it was 9.1(SD± 0.4), difference was found to be highly statistically significant.

The biologic mechanism by which H.pylori induces the alteration in the iron stores is not fully understood, but it seems to involve several, pathway's, including gastrointestinal blood loss, decrease in the absorption of dietary iron and enhanced uptake of the iron by the bacterium **(Malfertheiner et al., 2017)**.

In this study, H.pylori infected subject had been diagnosed with diabetes of a longer time, RBS measured at the time of the study was higher in H.pylori infected than in uninfected subjects, difference was found to be statistically significant, insulin requirement was almost the same between the two groups.

Mean HbA1c was 8.3 in H.pylori infected, while it was 7.8 in uninfected subjects which was not statistically significant, but by dividing patient into three groups (good, fair, poor control revealed 73.3% of H.pylori cases had glycosylated hemoglobin of 7-9 indicating fair control and 23.7 % had glycosylated hemoglobin >9 with poor control, the difference was statistically significant.

So our study confirmed that H.pylori infection has an impact on glycemic control.

These results are identical to that reported by **Rodolfo et al. (2002)** who found that among patients with type 1 diabetes, those with concomitant H pylori infection required higher doses of insulin and yet had higher levels of HbA than their uninfected counterparts.

CONCLUSION

In this study, no statistically significant difference was found regarding H .pylori positivity between diabetic cases and controls, as 60% of cases were positive compared to 45% of controls.

H.pylori infection is most frequently detected in individual of low socioeconomic status with insanitary water supplies and overcrowding and that was proved again in this study.

Alteration of glucose metabolism in diabetes may

promote H. pylori colonization, and for that in children with type 1 diabetes, H. pylori infection may have an impact on glycemic control.

RECOMMENDATIONS

1. Diabetic children with persistent abdominal pain and/or refractory iron deficiency anaemia should be screened for presence of H.pylori after exclusion of diabetic ketoacidosis.
2. Diabetic children infected with H. pylori should be adequately treated to decrease the incidence of metabolic disturbance caused by H. pylori.
3. More comprehensive studies on larger scale should be encouraged to assess prevalence of H. pylori in diabetic children.

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دراسة معدل إنتشار الإصابة بجرثومة المعدة لدى الأطفال المصابين بمرض السكرى من النوع الأول

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تنتشر البكتريا الحلزونية في جميع أنحاء العالم وهى تصيب الغشاء المخاطي في المعدة البشرية ولها القدرة على الاستمرارية في الأنسجة المصابة ما لم تعالج على نحو كاف ويصاب بهذا النوع من البكتريا نحو نصف سكان العالم وترتفع هذه النسبة الى ما يقرب من ثلثى سكان البلدان النامية.

ويلاحظ في الأطفال الذين يعانون من مرض السكري النوع الاول العديد من أعراض الجهاز الهضمي على ولكن يصعب تحديد مدى تأثيرها على السيطرة على السكر. ومن المحتمل الآن ان تأخر إفراغ المعدة والحركة غير المنتظمة لصمام المعدة ناتج عن وجود البكتيريا الحلزونية فى المعدة.

ومن المحتمل الان ان التغير فى ايض السكر لمرضى السكرى قد يكون ناتجا عن استيطان البكتريا الحلزونية فى المعدة.

وقد أجريت هذه الدراسة في الفترة ما بين أكتوبر 2020 وابريل 2021 وهى تهدف إلى تحديد مدى انتشار عدوى البكتريا الحلزونية فى الاطفال المصابين بمرض السكرى النوع الاول خلال مدة ستة أشهر.

وشملت الدراسة خمسون مريضا بداء السكري من النوع الأول (تتراوح أعمارهم بين 4 أعوام و 16 عاما) من المترددين على عيادة الأطفال بمستشفى سيد جلال الجامعي يشكون من أعراض الجهاز الهضمي أو فقر الدم

غير المبرر وجرى اختبار وجود الاصابة بالبكتيريا الحلزونية من عدمه عن طريق اختبار وجود مستضدات الجرثومة الحلزونية في البراز.

وأدرجت الدراسة عشرين من الاطفال الاصحاء غير المصابين بمرض السكرى الأطفال الأصحاء السكري (متطابقى العمر والجنس) للمقارنة.

لم يتم العثور فى هذه الدراسة على أية فروق ذات دلالة إحصائية فيما يتعلق بالبكتريا الحلزونية بين مرضى السكري وحالات الضوابط: حيث وجد ان 60٪ من الحالات كانت ايجابية اى مصابة مقارنة مع 45٪ من الضوابط.

اكدت الدراسة ان الاصابة بالبكتريا الحلزونية تزيد مع انخفاض الوضع الاجتماعى والاقتصادى للمريض ومع وجود امدادات مياه غير صحية وايضا مع التكدس السكانى وهو ما يتفق مع النتائج العالمية فى هذا المجال.

فى دراستنا كان هناك تأثير سلبى على نمو الاطفال المصابين: فقد كان هناك نقص في الوزن في 70 ٪ من الحالات الإيجابية.

وقد تم رصد اعراض غير هضمية اثناء العدوى بالبكتريا مثل فقر الدم بسبب نقص الحديد والتى رصدتها العديد من الدراسات وهذا يتفق مع دراستنا التى رصدت فقر الدم فى حوالى 76.6٪ من الأطفال المصابين.

و من اهم المظاهر السريرية فى دراستنا آلام في البطن وأعراض فقر الدم.

وعلى الرغم من ان المصاب بالبكتريا الحلزونية كان يعانى من مرض السكرى لفترة اطول الا ان احتياجات الانسولين لم تختلف كثيرا بين المصاب بالبكتريا وغير المصاب.

اما متوسط نسبة الهيموجلوبين السكرى بين المصاب بالبكتريا وغير المصاب لم تكن ذات دلالة إحصائية ولكن من خلال تقسيم المرضى إلى ثلاث مجموعات (جيد، مقبول، ضعيف) فقد اظهرت الدراسة ان 73.3٪ من الحالات المصابة بالبكتريا الحلزونية كانت نسبة الهيموجلوبين السكرى 7-9 وتشير الى تحكم مقبول و 23٪ من الحالات كانت نسبة الهيموجلوبين السكرى أكثر من 9 مع سيطرة ضعيفة على المرض وهو اختلاف له اهمية كبيرة من الناحية الاحصائية.

اما متوسط نسبة السكر العشوائى بين الحالات المصابة بالبكتريا الحلزونية و الحالات غير المصابة كان ذو دلالة احصائية.

هذه الدراسة أظهرت أن تقريبا اغلب المرضى بالبكتريا الحلزونية يعانون من فقر الدم مع مستوى الهيموجلوبين اقل من او يساوى 9، وكان متوسط مستوى الهيموجلوبين بين المرضى وغير المصابين له اهمية احصائية ايضا.

ومن كل ما سبق فقد اكدت دراستنا ان التغيرات فى ايض السكر لمرضى السكرى قد تساعد على تعزيز نمو البكتريا كما أن الاصابة بالبكتريا الحلزونية فى الاطفال الذين يعانون من مرض السكرى النوع الاول لها دور فى القدرة على السيطرة على ايض السكر والتحكم فى المرض.