

Investigating the Effect of eradication of *Helicobacter Pylori* Infection in Controlling Blood Sugar in Diabetic Patients

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ABSTRACT

Helicobacter pylori is one of the most prevalent chronic infections globally. It is hypothesised that diabetes mellitus increases the incidence of *Helicobacter pylori* infection; however, the available data on the relationship between *Helicobacter pylori* and the level of blood sugar control (HbA1C) in diabetics are limited and contradictory. The present study therefore aims to investigate the impact of *Helicobacter pylori* infection on the blood sugar control of diabetic patients. In this experimental study, 61 type II diabetic patients with or without dyspepsia symptoms, in whom *Helicobacter pylori* infection was proven by anti-*Helicobacter pylori* IgG serological method, were treated with four anti-*Helicobacter pylori* drug regimens (bismuth+ metronidazole) +tetracycline + omeprazole. The HbA1C level was quantified prior to the commencement of *Helicobacter pylori* infection treatment and two months following the conclusion of the infection treatment, following the confirmation of *Helicobacter pylori* infection eradication through urea breath test and the calculation of the mean HbA1C levels before and after the infection treatment. The data were analysed using the Statistical Package for the Social Sciences (SPSS) software and a paired Student's t-test. The results indicated that the average age of the subjects was 52.4±10.4 years, with 39 males (63.9%) and 22 females (36.1%) comprising the sample. The mean duration of diabetes at the time of diagnosis for the subjects in the study was 8.7±5.5 years. The results of this study demonstrate that *Helicobacter pylori* infection was successfully eradicated in all patients, as evidenced by the urea breath test (UBT). The mean HbA1C level prior to treatment was 8.6±1.2, while the mean HbA1C level following treatment was 7.9±1.2. This represents a statistically significant change (P<0.05). It was concluded that a positive relationship exists between the eradication effect of *Helicobacter pylori* and blood sugar control (reduction of HbA1C). However, further studies in diabetic patients are recommended to obtain more accurate results.

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1. Introduction

Helicobacter pylori infection is one of the most prevalent chronic infections globally. It has been definitively established that *H. pylori* is the primary causative agent of peptic ulcer disease. Furthermore, it is linked to other digestive disorders, including chronic gastritis, gastric adenocarcinoma, and MALT lymphoma, as well as non-digestive conditions such as atherosclerosis and diabetes mellitus. Recent studies have demonstrated a high prevalence of *Helicobacter pylori* infection in diabetic patients, which suggests a probable association with diabetes. As a consequence of autonomic neuropathy impeding the clearance of bacteria from the stomach and an inappropriate control of blood sugar disrupting the immune system, the prevalence of *Helicobacter pylori* infection is also demonstrated to increase in two patients in these studies. The eradication of the infection is associated with an increased risk of developing chronic complications (2). The management of hyperglycaemia is considerably more challenging in the presence of a *Helicobacter pylori* infection, and it is therefore recommended that patients with type 2 diabetes who are also infected with this bacterium receive appropriate treatment (3). It is also worth noting that studies have been conducted which demonstrate that there is no correlation between blood sugar control and the treatment of *Helicobacter pylori* infection. As a consequence of the aforementioned motility disorders of the upper digestive tract, which persist despite treatment, the impact of *Helicobacter pylori* treatment on blood sugar control remains unconfirmed (4). The objective of this study was to investigate the impact of *Helicobacter pylori* eradication on glycemic control in diabetic patients attending the endocrinology clinics of Al-Mahmoudiyah Hospital during the 2022-2023 period.

2. Materials and Methods

In this experimental study, which was conducted in the form of an After-Before design, an information form and an ethical consent form were completed among diabetic patients referred to the endocrinology clinic of Al-Mahmoudiah Hospital, with or without dyspepsia symptoms, who met the conditions for entering the study. Individuals with kidney failure, anaemia or haemoglobinopathy, or a history of antibiotic use in the previous month and proton pump inhibitor (PPI) use in the previous week, or patients who had previously undergone treatment for *Helicobacter pylori* infection, were excluded from the study. The IgG serology method (anti-*Helicobacter pylori* antibody measurement by ELISA) was employed, with IgG values exceeding 20 u/ml deemed indicative of a positive result. A total of 61 patients with type II diabetes and a confirmed *Helicobacter pylori* infection were treated with a four-drug anti-*Helicobacter pylori* regimen (BMTO, comprising bismuth, metronidazole, tetracycline and omeprazole) for a period of two weeks. The C1HbA level was initially assessed prior to the commencement of treatment for *Helicobacter pylori*

infection. Following the confirmation of *Helicobacter pylori* eradication via UBT, a second measurement was conducted two months later. This was followed by the initiation of treatment, with subsequent C1HbA assessments conducted at the outset and conclusion of treatment. The UBT test of carbon-14 was conducted using the Helioprobe method, with values below 25 cpm deemed indicative of a negative result. C1HbA measurement: The analysis was conducted using high-pressure liquid chromatography. The patients who were the subject of this study were advised to maintain their antidiabetic drug regimens (oral or insulin) and dietary habits and to continue with their usual levels of physical activity throughout the two-month follow-up period following the commencement of treatment for *Helicobacter pylori* infection. The data were subjected to statistical analysis using the SPSS software package. To enable comparison of C1HbA before and after treatment, a T-Test-Paired statistical test was employed, with a P value of less than 0.05, as shown in Figure 1, considered to be significant at a level of less than five hundred percent.

3. Results

In this study, 61 patients with type II diabetes were examined under treatment with oral drugs or insulin. Table 1 illustrates that the examined patients exhibited a range of ages between 34 and 58, with a mean age of 45.22 (± 7.8 SD). The sex distribution revealed that 39 patients (63.9%) were female and 22 patients (36.1%) were male. Additionally, 43 patients (70.5%) resided in urban areas, while 18 patients (29.5%) resided in rural areas. With regard to employment status, 46 patients (75.4%) were employed, 11 patients (18%) were smokers, and 61 patients (100%) had diabetes. Furthermore, 9 patients (14.7%) had hypertension. The following table illustrates that all the studied cases exhibited positive *H. pylori*. The mean haemoglobin (Hb) was 12.34 (± 0.75 SD), with a range of 11-13.7, while the mean white blood cell count (WBCs) was 8.4 (± 1.56 SD), with a range of 5. The mean PLTs was 248 (± 58.09 SD), with a range of 158 to 350. The mean HbA1C was 8.86 (± 1.11 SD), with a range of 6.7 to 10.8. The mean FBG was 147.56 (± 23.05 SD), with a range of 109 to 180. This table displays that 43 (70.5%) of the investigated cases responded to medical treatment. The data presented in this table demonstrate that, based on the follow-up laboratory results, the mean HbA1C was 8.34 (± 1.01 SD), with a range of 6.8-10.4, and the mean FBG was 132.28 (± 19.34 SD), with a range of 108-177. This table displays a statistically significant association between follow-up FBG and the response to treatment. The data presented in this table demonstrate that there were significant fluctuations in both HbA1C and FBG levels both before and after the specified period. All patients were diagnosed with *Helicobacter pylori* infection using the anti-*Helicobacter* IgG serological method. To ascertain whether the *Helicobacter pylori* infection had been eradicated, a urea breath test (UBT) was conducted on all patients two months following treatment. The results of this test were negative in all cases (Table 2-6).

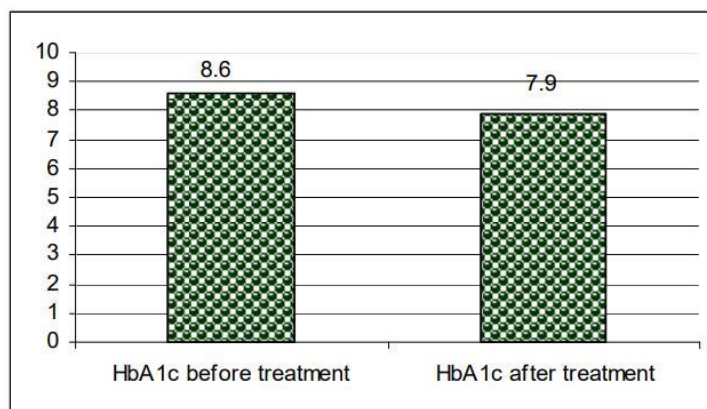


Figure 1. Comparison chart of c1HbA values before and after the treatment of *Helicobacter pylori* infection in the studied diabetic patients.

Table 2. Distribution of the analysed cases according to lab investigation.

Cases (n=61)		
Age (Years)		
Min.- Max.	34-58	
Mean ± SD.	45.22 ± 7.8	
Sex	No.	%
Female	39	63.9
Male	22	36.1
Residence		
Rural	18	29.5
Urban	43	70.5
Occupation		
Not working	15	24.6
Working	46	75.4
Smoking	11	18.0
Diabetes	61	100.0
Hypertension	9	14.7

Table 4. Cases investigated and their distribution in terms of lab follow-up

Cases (n=61)	
HbA1C	
Min.- Max.	6.8-10.4
Mean ± SD.	8.34 ± 1.01
FBG	
Min.- Max.	108-177
Mean ± SD.	132.28 ± 19.34

Table 5. Relation between follow up Lab and response to treatment

	Not responded (n=18)	Responded (1m after) (n=43)	Responded (3m after)	T	p
HbA1C					
Min.- Max.	6.9-10.4	6.8-9.6	6.5-9.0	1.958	0.056
Mean ± SD.	8.72 ± 1.17	8.15 ± 0.87	8.05 ± 0.80		
FBG					
Min.- Max.	108-177	109-159	115.40 ± 9.80	2.617	0.012
Mean ± SD.	141.71 ± 23.65	127.42 ± 14.89			

Table 6. Review of laboratory outcomes in cases that were treated before and after therapy

	Before (n=43)	After 1m (n=43)	T	p
HbA1C				
Min.- Max.	6.7-10.8	6.8-9.6	2.863	0.007
Mean ± SD.	8.92 ± 1.09	8.15 ± 0.87		
FBG				
Min.- Max.	110-180	109-159	6.984	<0.001
Mean ± SD.	150.42 ± 22.64	127.42 ± 14.89		

4. Discussion

Recent studies have indicated that *Helicobacter pylori* infection is associated with an increased risk of developing diseases such as diabetes mellitus and affects blood sugar control. The eradication of *Helicobacter pylori* infection has been shown to improve the control of metabolic complications and reduce the need for insulin and oral medications for blood sugar control in diabetic patients (2). With regard to the role of diabetes in the morbidity of patients with *Helicobacter pylori* infection and the relationship between *Helicobacter pylori* infection and its effects on blood sugar control (C1HbA or FBS) and chronic complications of diabetes, numerous studies have been conducted, yet the results have been contradictory (5-7). This study demonstrates that treatment of *Helicobacter pylori* infection in diabetic patients is effective in controlling blood sugar levels. Following a two-month follow-up period, the mean C1HbA level decreased significantly following treatment compared to the pre-treatment baseline. However, a study conducted by T. Khalil et al. in 2007 (6) The aforementioned study was conducted on patients with type 1 diabetes. The C1HbA levels of these patients were measured both before and after treatment, and no significant difference was observed. The study cohort comprised 61 patients with type II diabetes, with a male-to-female ratio of 39 (63.9%) to 22 (36.1%), with an average age of 52.4±10.4 years and an average duration of diabetes at the time of diagnosis of 8.7±5.5 years. In the study conducted by T. Khalil, 100 patients with type I diabetes were included. The mean duration of diabetes at the time of diagnosis was 6.2±2.3 years, with an average age of 14.2±2.8 years. The presence of *Helicobacter pylori* infection was determined through the use of the UBT test. In this study, the diagnosis of *Helicobacter pylori* infection was conducted using an anti-*Helicobacter* IgG serological method with ELISA, which was consistent with the approaches employed in other studies in this field (5, 8-11). In this study, the presence of *Helicobacter pylori* infection was confirmed in all root canal patients through the use of the UBT test. In contrast, the study conducted by T. Khalil and colleagues demonstrated that 78% of patients exhibited evidence of *Helicobacter pylori* infection through the UBT test, while 22% of patients required retreatment. In the study conducted by T. Khalil et al., C1HbA levels were measured on six occasions before and after treatment. The average

HbA1C levels before and after treatment were not significantly different, with a mean of 1.5±7.3% and 7.7±1.9%, respectively (P=0.31). Furthermore, after one year of regular follow-up, no appreciable effect on C1HbA levels was observed. In contrast, the present study revealed a statistically significant difference in HbA1C levels between the pre- and post-treatment periods (8.6±1.2 versus 7.9±1.2, P<0.05). In all studies examining the relationship between the therapeutic effect of *Helicobacter pylori* infection and HbA1C, it is essential to consider factors such as dietary habits, patient activity levels and changes in medication regimens, as these can influence HbA1C fluctuations. In this study, we aimed to minimise any significant changes in patients' diets and activity levels. In addition to the aforementioned discrepancies, the outcomes of the studies may be attributed to the selection of disparate control groups, varying sample sizes, the absence of adjustments for socioeconomic variables, the choice of *Helicobacter pylori* diagnostic methodology, the type of infection treatment administered, and the timing and geographical location of HbA1C measurements. In addition to the aforementioned cases, infection with the bacterium *Helicobacter pylori* causes damage to the gastric mucosa at the local level. Furthermore, the activation of humoral mechanisms, including IL-1, IL-6, TNF and inflammatory responses, results in systemic complications, as evidenced by 13 studies. Following the treatment of *Helicobacter pylori* infection, a reduction in the levels of CRP, Lp(a) (reactive C protein) and a-lipoprotein has been observed in type I diabetic patients. This reduction in inflammatory markers has been associated with a decreased risk of cardiovascular events, which provides a rationale for the role of *Helicobacter pylori* infection in this process. An elevated CRP level is indicative of systemic inflammation. In light of the aforementioned research, it may be posited that the reduction in HbA1C levels and the management of metabolic complications associated with diabetes following the treatment of *Helicobacter pylori* infection can be attributed to the decline in systemic inflammatory factors and the enhancement of gastric function. In light of the established link between diabetes and *Helicobacter pylori* infection, and given the evidence from existing research indicating a correlation between the efficacy of *Helicobacter pylori* treatment and improved blood sugar control (decreased HbA1C), it is recommended that further

studies be conducted in diabetic patients to enhance blood sugar management.

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Authors' Contribution

Study concept and design: M.A.F.

Acquisition of data: M.A.F.

Analysis and interpretation of data: M.A.F.

Drafting of the manuscript: M.A.F.

Critical revision of the manuscript for important intellectual content: M.A.F.

Statistical analysis: M.A.F.

Administrative, technical, and material support: M.A.F.

Ethics

We hereby confirm that all ethical standards have been respected in the preparation of the submitted article in accordance with the guidelines set forth by the ethics committee of Alsalam University College, Baghdad, Iraq.

Conflict of Interest

The authors declare that they have no conflict of interest.

Data Availability

The data that support the findings of this study are available on request from the corresponding author.

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