Detection of *Helicobacter pylori* specific IgG antibodies and serum magnesium ions in type two diabetes mellitus (T2DM) patients

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Received 1 April 2014 ; Accepted 16 November 2014

ABSTRACT:

The aims of this study were :A) to evaluate the seroprevalence of *Helicobacter pylori* infection among adult type-2 diabetes mellitus patients in Kirkuk city by using an immunochromatography method. B) To investigate the probable association of serum magnesium ions (Mg^{+2}) with *Helicobacter pylori* infection in the patients. One-hundred twenty five diabetic patients were evaluated (53 males and 72 females), their age ranged between 21 and 83 years. Anti- *H. pylori* IgG antibody was assessed serologically by using immunochromatography method. All patients' serum magnesium ions were estimated. *Helicobacter pylori* infection was diagnosed in 85 diabetic patient (68%), 47 males (55.2%) and 38 females (44.7%). A significant relationship between *H. pylori* seropositivity and serum magnesium ions ($p<0.01$) was noticed. We concluded that high serum magnesium ions level associated with high risk of infection with *H. pylori*. Diabetic patients are more prone to acquire *H. pylori* infection.

Keywords: *H. pylori*, type-2 diabetes mellitus, Mg^{+2}.

الكشف عن الاجسام المضادة IgG لبكتريا بوابات المعدة الحلزونية و آيونات المغنسيوم في مصل مرضى السكر من النوع الثاني

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الملخص:

هدفت الدراسة: أ) لتقييم التشخيص المبكر والانتشار المصلي لعدوى بكتريا بوابات المعدة الحلزونية بين الكبار المصابين بمرض السكري من النوع-2 في مدينة كركوك باستخدام طريقة Immunochromatography. ب) للتحقق من الارتباط المحتمل بين نسبة آيونات المغنيسيوم في المصل وعدوى بكتريا بوابات المعدة الحلزونية في المرضى. تم تقييم مائة خمسة وعشرين من مرضى السكري (53 ذكور و 72 إناث)، تراوحت أعمارهم بين 21 و ٨٣ عاما .الاجسام المضادة لبكتريا بوابات المعدة الحلزونية (IgG) تم الكشف عنها بالطريقة المصلية باستعمال طريقة Immunochromatography، و قمنا بتقدير نسب آيونات المغنيسيوم لجميع المرضى. تم تشخيص الاصابة ببكتريا بوابات المعدة الحلزونية في ٨٥ (68%) مريض سكري، ٤٧ من الذكور (55.2%) و ٣٨ من الإناث (44.7%). لوحظ وجودعلاقة ذات دلالة إحصائية بين الاستجابة للأمصال بكتريا بوابات المعدة الحلزونية وآيونات المغنيسيوم في الدم ($p<0.01$). لقد تم الاستنتاج ان نسبة آيونات المغنيسيوم العالية في المصل مرتبطة بمخاطر عالية للإصابة ببكتريا بوابات المعدة الحلزونية و مرضى السكري هم أكثر عرضة لاكتساب بكتريا بوابات المعدة الحلزونية.

الكلمات المفتاحية: بوّابات المعدة الحلزونية، مرض السكري من النوع-2، آيونات المغنسيوم.

Introduction:

Helicobacter Pylori is a spiral gram negative bacterium that colonizes the human stomach and is the main cause of peptic ulcer, gastric adenocarcinoma and primary gastric lymphoma in adulthood[1]. *Infection* with *Helicobacter pylori* has been recognized as a public health problem worldwide [2]. Affecting approximately 50% of the world population and more prevalent in developing than the developed countries [3]. Most adult patients acquire the infection during childhood, through various transmission pathways such as feco-oral, oro-oral or gastro-oral transmission [4]. *Helicobacter Pylori* is a common infection in diabetics who do not have adequately controlled hyperglycemia and these are individuals who are colonized by *H. pylori* in the gastric antrum [5]. Evidence has been published suggesting that the prevalence of *H. pylori* infection might be increased in patients with type-2 diabetes mellitus (T2DM) when compared with the normal population [6,7]. The *H. pylori* – induced inflammatory response affects many gastric cell types, including those responsible for leptin and ghrelin production which belong to a numerous group of hormones and other factors which take part in glucose homeostasis regulation. Glucose homeostasis reflects the balance between the amount of it entering the blood stream and glucose used up by the body [8]. Ghrelin takes part in glucose homeostasis by regulation the secretion and affecting the insulin sensitivity of tissue [9,10,11]. Magnesium seems to be an important factor for both gastric acid secretion regulation (together with Ca^{++}) and survival and virulence of *H. pylori* [9]. Therefore it is important to assess if *H. pylori* infection is accompanied by variations in the serum Mg^{+2} levels in patients with T2DM [12]. The aims of our study were: A) To evaluate the early diagnosis and the seroprevalence of *Helicobacter pylori* infection among adults with type-2 diabetes mellitus patients in Kirkuk city. B) To investigate the probable association of serum magnesium ions (Mg^{+2}) with *Helicobacter pylori* infection in the patients.

Materials and methods:

Study population:
This study was carried out from August 2012 to May 2013. One hundred twenty five of adult diabetic patients, male 53 (42.4%) and female 72 (57.6%) with ages between 21 and 83 years at the Kirkuk and Al-Azadi teaching hospital were enrolled in this study.

Sample collection:
Serum samples were collected from each adult diabetic patient and the sera were analyzed for the detection of the *H. pylori*-specific immunoglobulin G (IgG). The remaining sera were frozen and stored at -20 ˚C until used for the estimation of the magnesium ions level.

Questionnaires:
Assessment of the diabetic patient's health status and demographic characteristics was based on data from questionnaires. The questionnaires concerned the age, sex and weight. A questionnaire was filled out for each patient by the physician.

Serum determination of IgG to *H. pylori*:

The determination of specific IgG antibodies was done using an Immunochromatography test (ICT). ICT test was performed by the commercial test kit (*ACON*®; 4108 Sorrento Valley Blvd., San Diego, CA 92121, USA) according to the instructions of the manufacturer.

Estimation of the serum magnesium level:

Serum magnesium ions level was measured by use of the commercial available kit (BIOLABO; France) and the 721-2000 Spectrophotometer. The magnesium ions assay was used according to the manufacturer's instructions. The normal value of serum Mg^{+2} is (0.66 – 1.07 mg/dl).

Statistical analysis:

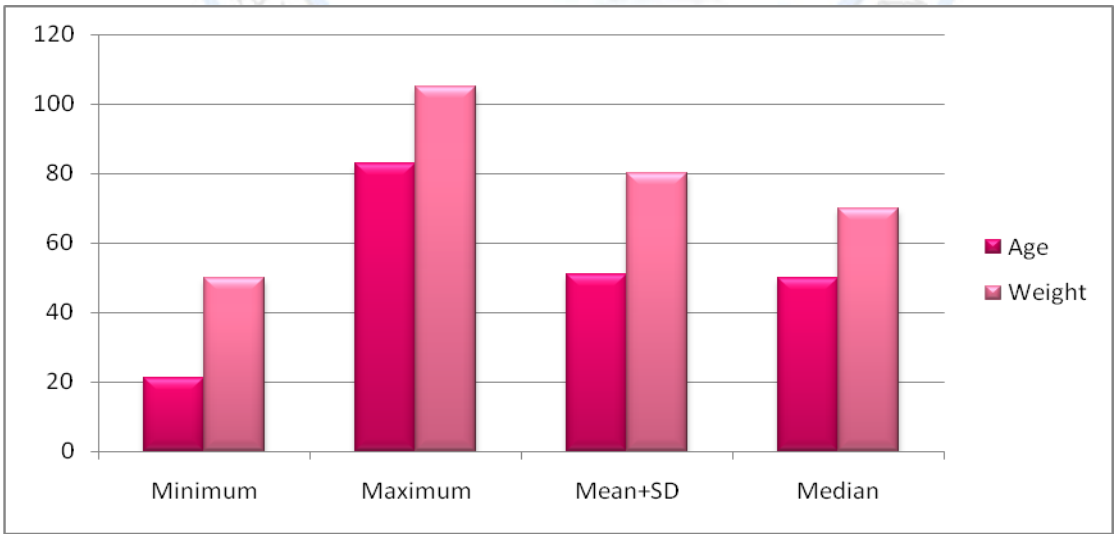
The data of the patients were analyzed using the T-test [13].

Result:

Out of a total number of 125 subjects, 53 were males (42.4%) and 72 were females (57.6%). Majority of patients were more than 21 years, mean age +SD (50.78). The patients were over 50 Kg mean weight +SD (79.9), (table-1, figure -1).

(Table-1): Evaluation of age and weight in studied population

Total (125) patients	Minimum	Maximum	Mean+SD	Median
Age	21	83	50.78±0.9	50
Weight	50	105	79.9±1.1	70



(Figure -1): Ages and weight in studied population

The seropositivity to *H. pylori* IgG specific antibodies was detected in 85 (68%) diabetic patients. In our study we found that seropositivity to *H. pylori* was more common in males than females, in which 47 (55, 2%) from 85 *H. pylori* infected patients were males and 38 were females (44.7%) (table-2).

Infected diabetic patients with *H. pylori* had significantly higher magnesium ions concentration in serum (table-2).

(Table-2): Association of sex and magnesium ions with *Helicobacter pylori* seropositivity

Characteristic	*H. pylori* positive NO. (%)	*H. pylori* negative NO. (%)	Total NO. (%)	*p*-value
Sex				
Male	47 (88.6%)	6 (11.3%)	53 (42.4%)	NS
Female	38 (52.7%)	34 (47.2%)	72 (57.6%)	NS
Total	85 (68%)	40 (32%)	125 (100%)	
Mg				
Mg ≤ 0.66	8 (57.1%)	6 (42.9%)	14 (11.2%)	NS
0.66<Mg≤1.07	29 (61.7%)	18 (38.2%)	47 (37.6%)	NS
Mg>1.07	45 (70.3%)	19 (29.7%)	64 (51.2%)	P<0.01
Total	82 (65.6%)	43 (34.4%)	125 (100%)	

*NS: non significant.

In this study a significant association between *H. pylori infection* and magnesium ions level in the studied patients was detected ($p < 0.01$).

Discussion:

The prevalence of *H. pylori* infection has been reported to range between 30-80% in diabetic patients [14, 15]. In our study the prevalence of *H. pylori* infection in diabetics was found to be 68%. Patients with diabetes mellitus are often affected by chronic infection.

Many studies have evaluated the prevalence of *H. pylori* infection in diabetic patients and possible role of this condition in their metabolic control. Some studies found higher prevalence of the infection in diabetic's patients and reduced glycemic control while other did not support any correlation between metabolic control and *H. pylori* infection [16].

The present study determines the relationship between type-2 diabetes and *H. pylori* infection and found that diabetic patients are more prone to acquire *H. pylori* infection and similar result also detected in the study conducted at Japan by *Kimiaki et al* [17].

The high prevalence of *H. pylori* infection in patients with diabetes is generally explained by reduced gastric motility and peristaltic activity which may promote *H. pylori* colonization, various chemical changes in gastric mucosa following non enzymatic glycosylation of muscin or increased sialic acid which may involve as receptor for *H. pylori* on cell surface by promoting adhesion of *H. pylori* to gastric mucosa cell and an impaired non specific immunity observed in patients with diabetes [9, 18, 19, 20]. As well *H. pylori* strain play role in the homeostasis of leptin and ghrelin (two hormones critical to energy homeostasis and metabolism) in addition *H. pylori* is associated with chronic inflammation, particularly among *H. pylori* strains which contain Cag antigen. There is evidence that this inflammation may extend beyond gastrointestinal tract affecting insulin and glucose metabolism [21].

We had shown a positive association between serum magnesium level and *H. pylori* infection. It seems that the cation metabolism of the gastric pathogen *H. pylori* is of substantial importance for survival in hostile and changing environmental of gastric mucosa [22, 23].

Serum magnesium is a cofactor of many enzymes involved in central biochemical pathway with in human host; pathogenic bacteria express specific serum magnesium uptake systems which are essential for their viability [24, 25]. Most of *H. pylori* related diseases are associated with male gender, the role of gender as a risk factor for *H. pylori* infection is still debated.

The present study show that the *H. pylori* was most common among males while another study conducted by Catherin confirm the males predominance of *H. pylori* infection in adults as a global and homogenous phenomenon [26]. In another study the *H. pylori* infected female were predominant as compared to males that contradicts our statement [27]. *Helecobacter pylori* is an important cause of chronic active gastritis and plays an important role in the etiology of peptic ulcer disease in humans [28, 29]. This study concludes that:

1-The detection of *H. pylori* IgG antibodies in serum is a useful screening method for *H. pylori* seroprevalence evaluation.

2-*Helicobacter pylori* infection is most common in diabetic patients with significant statistical association between being diabetic and the acquiring of *H. pylori* infection.

3-High serum magnesium ions level associated with high risk of infection with *H. pylori*.

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