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Influence of *Helicobacter pylori* infection on HbA1c (Glycated Haemoglobin) Levels: A Systematic Review

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Abstract

Influence of *H. pylori* infection on HbA1c levels, it is an important to eradicate the Infection and control the glucose levels**.** An early discovery of the changes in blood glucose helps to prevent or delay the development of type 2 diabetes and complications. *H. pylori* treatment could have an important role in improving insulin resistance. We performed a research literature of the PubMed, Cochrane Library, and Chinese Bio Medicine Web Base and Chinese Science and Technology Journals databases databases for studies of the Influence of *H pylori* infection on HbA1c levels from the last 10 years. The data from this study are taken from PubMed, Cochrane Library, and Chinese Bio Medicine databases for studies of the Influence of *H. pylori* infection on HbA1c levels from the last 10 years. We selected 5 studies that included 2456 Patients.

Keywords: HbA1c; *Helicobacter pylori* infection; Type 2 diabetes

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Introduction

Helicobacter pylori are a microaerophilic bacterium that is commonly found in patients with gastrointestinal disorders. It is present in approximately one half of the world's population.

The most of the people who are infected have no symptoms however *Helicobacter pylori* is capable of causing some digestive problems such as Abdominal Pain (mild to severe), Belching and Gastric reflux, Mild nausea, Irritable Bowel Syndrome, Bloating and distension, Constant bad breath, Hypochlorhydria. Most commonly associated with Peptic Ulcer Disease (PUD) is responsible for the development of 70% of Gastric and 80 to 95% of Duodenal Ulcers that can be may lead to the development of Cancers [1].

Helicobacter pylori were found high percentage in the polluted well water, contaminated food, faeces, and Dental plaque/saliva [2]. Transmission through unclean water from person to person, faecal-oral by poor hygiene not properly washing hands after using the toilets, oral-oral by kissing or gastro-oral. This continues to cause inflammation in mononuclear cells that stimulate an initial inflammatory effect, which can lead to duodenal and stomach ulcer.

H. pylori and diabetes mellitus can increase gastrointestinal problems such as dyspepsia, etc. worsening the blood glucose levels and metabolic control by decrease levels of immunity increase risk of *H. pylori* infections.

Literature Review

Diabetes mellitus is a chronic endocrine disorder characterized by high levels of blood glucose (hyperglycaemia) occurring from lacks in insulin secretion, insulin action, or both that globally affected 422 million adult people according to World Health Organization (WHO). Diabetes has a global impact that rises from 4.7% to 8.5% since 1980 in Population. Past year's diabetes has increased in low levels and middle-level income countries.

According to Robert Koch Institute (RKI) in Germany data shows that 6.7 million adults are affected by Diabetes Mellitus in the whole of Germany. The German Federal Ministry of Health (BMG) funds this research to collect data's to develop of health care policy for the treatment and prevention of diabetes.

Helicobacter pylori and Diabetes

Diabetes-induced impairment of cellular and humoral immunity may improve a unique sensibility to *H. pylori* infection [3]. There is no evidence showing that *H. pylori* plays a significant role in diabetes, there is more possibility for increased susceptibility to infection in diabetic patients. Diabetes-induced reduction of gastrointestinal motility and acid secretion may promote

pathogen colonisation and infection rate in the gut [4]. Changed glucose metabolism may produce chemical changes in the gastric mucosa that promote *H. pylori* colonisation [5]. All these factors can contribute to *H. pylori* infection to development of diabetes.

H. pylori and Insulin secretion

Decreased insulin secretion is one of the significant causes In Type II Diabetes. Defects in ß cell function characterize progression from normal glucose tolerance to prediabetes and Type II Diabetes Mellitus [6]. According to the study by Hsieh et al. the Patients with *H. pylori* infection was more likely to have impaired insulin secretion which may increase the risk for type II Diabetes [7].

Associated factors of *H. pylori* and Diabetes

Lifestyle is a significant factor influencing both chronic *H. pylori* infection and Type II Diabetes. *H. pylori* infection could delay gastric emptying, which can be assumed to cause a mismatch between the onset of insulin action and absorption of carbohydrates in insulin-dependent with diabetes [8,9]. *H. pylori* infection has also been associated with platelet activation and aggregation, increases in pro-atherogenic factors such as homocysteine, generation of reactive oxygen species, and increases in lipid peroxides [10].

Obesity

Obesity is the primary etiological cause of Type II Diabetes Mellitus with controlled clinical trials determining that a weight loss is sufficient to prevent most obese subjects with impaired glucose tolerance from contracting the disease [11]. According to some studies High BMI, Obesity may be associated with an increased incidence of *H. pylori* colonisation from reduced gastric motility [12].

Dyslipidaemia

In type II Diabetes Obesity, Insulin resistant by defects in Insulin action and hyperglycemia leads to changes in lipoproteins plasma levels. Abnormalities can found in lipoprotein commonly in type II Diabetes [13].

Hypertension

Hypertension usually has no sign or symptoms. Increase levels of blood pressure are high risk to develop other diseases such as Kidney disease, Diabetic Retinopathy in long-term can cause blindness. Chronic cases with ageing can cause Alzheimer's disease or Dementia. There is a High risk of Stroke and Heart attack.

A strong association between obesity was shown in multiple studies. According to the study by De Segula in 2014 [14], one of the largest cohorts studied 82473 revealed a positive association between BMI and hypertension at the age of 18 years and midlife. There was also marked an increase in hypertension risk with weight gain. Framingham study showed that the relative risk in overweight men and women were 1.46 and 1.75, respectively, after adjusting for age. Furthermore, weight reduction of obese females at the age of 18 had led to a reduction in the risk of hypertension. In older populations, hypertension and obesity continue to relate predictably as has been shown in the Honolulu Heart Program and Japanese data survey [14].

What is Glycated Haemoglobin (Hemoglobin A1C)?

In red blood cells contains a Protein called Haemoglobin (Hb) which carries O_2. Glucose in bloodstream connects to the protein Haemoglobin in red blood cells and forms glycated haemoglobin. Haemoglobin in red blood cells bind with the glucose and stays for 3 Months. HbA1c test shows average blood glucose levels in the past 3 Months.

Pathogenetic mechanisms in *H. pylori* and diabetes

In Cong He, Zhen Yang, and Nong-Hua Lu 2014 [15] studies wrote that there is no concrete evidence demonstrating that *H. pylori* play a role in diabetes, the possibility for a causal relationship is an intriguing issue deserving discussion. There are several lines of evidence to implicate increased susceptibility to infection in diabetic patients. Firstly, a diabetes-induced impairment of cellular and humoral immunity may enhance an individual's sensitivity to *H. pylori* infection. [16] Secondly, diabetes-induced reduction of gastrointestinal motility and acid secretion may promote pathogen colonisation and infection rate in the gut [17]. Thirdly, altered glucose metabolism may produce chemical changes in the gastric mucosa that promote *H. pylori* colonisation [18].

Finally, individuals with diabetes are more frequently exposed to pathogens than their healthy counterparts as they regularly attend hospital settings [19]. However, there are also indications that *H. pylori* infection may contribute to the development of diabetes. Whereas insulin insensitivity is an early phenomenon, pancreatic β-cell function declines gradually over time before the onset of clinical hyperglycemia, the result of many factors that can be influenced by infection, such as insulin resistance (IR), glucotoxicity, lipotoxicity, β-cell dysfunction, chronic inflammation, and genetic and epigenetic factors [20,21].

H. pylori eradication and diabetes

According to Cong He, Zhen Yang and Nong-Hua Lu studies "There are limited and conflicting data regarding the effect of *H. pylori* eradication on glucose metabolism and insulin sensitivity [22]. However, it may be beneficial for patients at risk of diabetes to be checked for the presence of *H. pylori* infection, as a report by Zojaji et al. [23] showed that *H. pylori* treatment could improve the mean HbA1c and the metabolic abnormalities in patients with T2DM. Additionally, Gen et al. [24] demonstrated that successful *H. pylori* eradication significantly decreased fasting insulin and HOMA-IR levels. Other studies focused on the effects of eradication on *H. pylori*-stimulated inflammatory cytokines. Some reports indicate that CRP levels are decreased after *H. pylori* eradication, suggesting a beneficial effect on low-grade inflammation [25] However, there are also reports showing no effect of *H. pylori* eradication on mean HOMA-IR and CRP levels

[22] or HbA1c levels [26]. Recently, Vafaeimanesh et al. [27] found that in patients with T2DM, the mean decrease in HbA1c and fasting plasma glucose levels in eradicated cases was similar to non-eradicated subjects three and six months after treatment.

Discussion and Conclusion

All patients infected with *Helicobacter pylori* should be monitored for glucose, HbA1c, lipid profile, BMI, blood pressure. Previous studies on the association between *H. pylori* and diabetes have had mixed results, however the results show positive association between *H. pylori* status and HbA1c levels among adult participants free of diabetes. The increased levels of HbA1c associated with *H. pylori* were greater among those with higher BMI.

"Obesity is an established risk factor for diabetes and it is known that high BMI is associated with elevated HbA1c. Separately, the presence of H. pylori is also associated with elevated HbA1c," said Dr. Blaser, who has studied the bacteria for more than 20 years. We hypothesized that having both high BMI and the presence of *H. pylori* would have a synergistic effect, increasing HbA1c even more than the sum of the individual effect of either risk factor alone.

In an accompanying editorial in The Journal of Infectious Diseases, Dani Cohen, PhD, of Tel Aviv University in Israel, pointed out that while previous studies have addressed the association between type II diabetes and *H. pylori* in small samples, this study analyzed two independent large national samples of the general population. Dr. Cohen agreed with the study authors, suggesting that adults infected with *H. pylori* with higher BMI levels, even if asymptomatic, may need anti *H. pylori* therapy to control or prevent type II diabetes. If the study findings are confirmed, Dr. Cohen wrote, they "could have important clinical and public health implications."

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