pISSN: 2234-8646 eISSN: 2234-8840
http://dx.doi.org/10.5223/pghn.2016.19.2.110
Pediatr Gastroenterol Hepatol Nutr 2016 June 19(2):110-115

Original Article

PGHN

The Association between *Helicobacter pylori* Infection and Body Weight among Children

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Purpose: We performed to reveal the association between the *Helicobacter pylori* infection and body weight among children.

Methods: Out retrospective study included patients who underwent the *H. pylori* immunoglobulin G testing at Konyang University Hospital between March 2011 and June 2014. These patients were classified as seropositive (28 boys, 27 girls; mean age: 9.89±3.28 years) or seronegative (55 boys, 54 girls; mean age: 9.84±3.02 years). Next, we compared various characteristics between the seropositive and negative groups, as well as between obese children (body weight ≥90th percentile) and non-obese children (body weight <90th percentile). Furthermore, we compared the change in body weight after 2 months of treatment with amoxicillin, clarithromycin and omeprazole among the 55 seropositive children (14 treated children and 41 non-treated children).

Results: There were no differences in the weights and laboratory data for the 55 seropositive children and 109 seronegative children (weight; 40.96±18.11 kg vs. 36.85±13.72 kg, respectively; p=0.14). And, there was no difference in the prevalence of *H. pylori* infection among the 29 obese and 135 non-obese children (p=0.581). However, after 2 months of eradication, the 14 treated patients exhibited a significant weight gain (+0.91±0.52 kg), compared to the 41 non-treated patients (−0.29±1.16 kg, p=0.025).

Conclusion: Our findings present that obesity was not associated with the *H. pylori* infection, although *H. pylori* eradication led to significant increase in body weight.

Key Words: Helicobacter, Obesity, Body weight, Disease eradication, Child

INTRODUCTION

The *Helicobacter pylori* infection is one of the causes in the gastritis, gastric and duodenal ulcer, and stomach cancer. In addition several studies have described that the infection of *H. pylori* is associated with various extra-gastric conditions, such as diabetes mellitus (DM) [1-4], dyslipidemia [5-7], cardiovascular disease [8,9] and ischemic cerebrovascular disease [10,11]. But, the association between

Received : September 30, 2015, Revised : December 31, 2015, Accepted : January 14, 2016

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infection of *H. pylori* and obesity is unclear, as various studies have reported conflicting findings regarding whether obesity is associated with this infection. For example, one study has demonstrated the positive association between the *H. pylori* positivity and body mass index (BMI) in individuals who were >15 years old [12], and another study has demonstrated that the prevalence of *H. pylori* infection was 57.2% among obese adults and 27.0% among non-obese adults [13]. In contrast, several studies have reported that obesity was not associated with the *H. pylori* infection [14,15]. Nevertheless, several studies have demonstrated that *H. pylori* eradication leads to increased BMI, owing to recovery of gastric acid secretion and improved pancreatic function [16-18]. However, almost all of these studies examined adult patients, except one study that reported *H. pylori* infection was associated with DM among children. Therefore, we performed this study to evaluate the association between the *H. pylori* infection and obesity among children and to examine the relationship between the eradication of *H. pylori* and weight gain.

MATERIALS AND METHODS

We retrospectively reviewed the medical records of all children who underwent *H. pylori* immunoglobulin G (IgG) test with IMMULITE 2000 kits (DPCLab Diagnostic Products Corporation, Los Angeles, CA, USA) at Konyang University Hospital between March 2011 and June 2014. They had several gastrointestinal symptoms–recurrent abdominal pain, heartburn, dyspepsia, nausea, vomiting, and weight loss. A total of 55 children had a positive result, and we randomly selected 109 IgG-negative age- and sex-matched children (approximately double the number of positive children) to serve as the controls. We also classified the included patients as obese (body weight ≥90th percentile, 29 patients) and non-obese (body weight <90th percentile, 135 patients) to investigate the difference in sero-positivity of *H. pylori* between two groups.

Fourteen patients who exhibited serious symptoms and positive results from rapid urease test (RUT), biopsy and urea breath test (UBT) in the 55 seropositive patients were treated with amoxicillin, clarithromycin, and omeprazole for 2 weeks. Twelve of the 14 treated patients tested positive in the RUT or via histologic examination, and 2 of these patients tested positive in the UBT. The other 41 seropositive patients were treated using symptomatic care, and we compared the change in body weight for the treated and non-treated groups via outpatient follow-up after 2 months of treatment. Fifteen patients in the non-treated group were treated using a proton pump inhibitor or H2 receptor blocker.

All statistical analyses were performed by IBM SPSS Statistics ver. 19.0 (IBM Co., Armonk, NY, USA), and differences with a p-value of <0.05 were considered statistically significant. Inter-group comparisons were performed by the dependent Student t-test or chi-square test, as appropriate. All data was presented as mean±standard deviation or number (%).

RESULTS

The association between the infection of *H. pylori* and obesity

When we compared the seropositive children (28 boys, 27 girls; mean age: 9.89±3.28 years) and the seronegative children (55 boys, 54 girls; mean age: 9.84±3.02 years), we did not observe any significant differences in their laboratory data. The seropositive patients were slightly heavier than the seronegative patients (40.96±18.11 kg vs. 36.85±13.72 kg), although there was no statistically significant differences (Table 1). The obese group (29 patients) included 11 seropositive children (37.9%), and the non-obese group (135 patients) included 44 seropositive children (32.6%); this difference was not statistically significant (Table 2).

Does eradication of *H. pylori* lead to increased body weight?

There was no significant difference in the initial body weights of the treated and non-treated groups.

Table 1. The Demographic and Laboratory Characteristics of the Seropositive and Seronegative Groups

Characteristic	*Helicobacter pylori* immunoglobulin G		*p*-value
	Seropositive (n=55)	Seronegative (n=109)	
Sex			0.96
Male	28 (50.9)	55 (50.5)	
Female	27 (49.1)	54 (49.5)	
Age (yr)	9.89±3.28	9.84±3.02	0.93
Weight (kg)	40.96±18.11	36.85±13.72	0.14
White blood cell count (/μL)	7,554.55±2,238.29	7,053.21±2,346.49	0.19
Hemoglobin (g/dL)	13.08±0.84	12.94±0.97	0.35
Hematocrit (%)	38.79±2.51	38.77±5.27	0.97
Platelet (/μL)	289,890.91±70,775.77	282,692.42±117,861.17	0.97
Glucose (mg/dL)	94.15±9.90	104.25±78.25	0.68
Aspartate aminotransferase (IU/L)	25.13±7.21	25.56±7.63	0.34
Alanine aminotransferase (IU/L)	14.67±6.69	15.25±9.23	0.73

Values are presented as number of cases (%) or mean±standard deviation.

Table 2. The Prevalence of *Helicobacter pylori* Infection in the Obese and Non-Obese Groups

H. pylori infection	Body weight		*p*-value
	Obese group (≥90th percentile)	Non-obese group (<90th percentile)	
H. pylori IgG positive	11 (37.9)	44 (32.6)	0.581
H. pylori IgG negative	18 (62.1)	91 (67.4)	
Total	29 (100.0)	135 (100.0)	

Values are presented as number of cases (%).
IgG: immunoglobulin G.

Table 3. The Change in Body Weight after *Helicobacter pylori* Eradication in Obese Group

Body weight	*H. pylori* eradication		*p*-value
	Treatment (n=14)	No treatment (n=15)	
Initial weight (kg)	40.65±20.07	41.10±22.99	0.991
Change in body weight (kg)	+0.91±0.52	−0.29±1.16	0.025

Values are presented as mean±standard deviation.
By dependent Student t-test.

After 2 months of eradication treatment using omeprazole, amoxicillin, and clarithromycin, the 14 treated patients exhibited an increased body weight (+0.91±0.52 kg). In contrast, 15 non-treated patients who were successfully followed-up exhibited a decreased body weight (−0.29±1.16 kg), and this difference was statistically significant (p=0.025) (Table 3). However, 26 of the 41 non-treated children were lost to follow-up.

Thirteen of the 14 treated patients underwent upper endoscopy and were diagnosed with nodular gastritis (6 patients), erythematous gastritis (3 patients), hemorrhagic gastritis (1 patient), and atrophic gastritis (1 patient). Two patients exhibited normal upper endoscopy findings.

DISCUSSION

This retrospective study aimed to reveal the relationships between infection of *H. pylori* and obesity among pediatric patients. Our findings indicate that obesity was not associated with *H. pylori* infection, although triple eradication therapy led to an increase in body weight.

The association between *H. pylori* infection and BMI remains unclear, as is the relationship between eradication of *H. pylori* and change in body weight. For example, several studies have described that the prevalence of *H. pylori* infection was higher in patients with a high BMI [13,19,20]. Arslan et al. [13] have also descripted that the prevalence of *H. pylori* infection is higher in their obese group by impaired immunity. In contrast, similar to our findings, other studies have descripted that *H. pylori* infection is not associated with BMI or being overweight [14,15]. Ioannou et al. [14] have described that *H. pylori* infection is not associated with BMI because it did not change serum leptin levels in their study. However, one study have descripted that *H. pylori* infection was negatively associated with the BMI among 4-15-year-old individuals, but was positively associated with BMI in >15-year-old individuals [12]. These discrepancies are likely caused by a complex group of factors, as being obese or overweight is the result of multiple factors, including—age, personal habits, socioeconomic environment, culture, hormonal change and chronic diseases like metabolic syndrome. Furthermore, most of the previous studies evaluated adult populations, and only small number of studies evaluated children. In our study, the infection of *H. pylori* is not associated with overweight, although we cannot comment on the reason for this absence of a relationship, as we did not evaluate many of the factors that are associated with being overweight or obese.

Interestingly, many studies have described that the relationship of *H. pylori* infection and metabolic disease, such as DM and dyslipidemia, among adults [2-7]. For example, one study descripted that the prevalence of *H. pylori* infection was higher in the DM patients [2], and another study described that *H. pylori* infection was associated with elevated serum lipid levels [6]. Therefore, additional studies are needed regarding the relationship between these metabolic diseases and *H. pylori* infection among children.

In this study, we observed that triple therapy of *H. pylori* induced weight gain, and previous studies have reported similar findings [16,17,21-23]. Kamada et al. [22] described that the *H. pylori* eradication led to increased obesity, but also improved the patients' dyspeptic symptoms and quality of life. Furthermore, Loffeld [24] reported that eradication of *H. pylori* led to increased body weight and appetite, due to changes in the patients' ghrelin and leptin levels. The *H. pylori* eradication led to decreased gastric leptin levels and improved pancreatic function, which might lead to increase in BMI [17,21]. Ghrelin-a gut-brain peptide hormone that regulates appetite – enhances the gastric emptying and gastrointestinal motility [25-27], and two studies have demonstrated that *H. pylori* eradication led to increased ghrelin levels [28,29]. Based on the results of these reports, we hypothesize that these diverse mechanisms (relieving gastric symptoms, hormonal changes, and improved quality of life owing to regular meals) may be responsible for the post-eradication weight gain that we observed in this study.

The use of *H. pylori* immunoglobulin as a diagnostic marker has high sensitivity and specificity in adults, although this method is rarely used in children, because of its low sensitivity [30]. Therefore, we only performed *H. pylori* eradication in the 14 patients who also tested positive in the RUT, histological examination or UBT. Thus, the remaining 41 seropositive patients with no other warning signs were only treated using supportive care.

This study has some limitations. Our study was performed at the single institution, and our findings may not be representative of a broader patient population. Second, we only evaluated a small number of patients in the eradication and control groups, and our control group may have been affected by selection bias. Third, the most commonly used index to

determine obesity is BMI, although we were unable to reveal the association between the BMI and infection of *H. pylori* because height was not recorded for a large number of our patients. Therefore we categorized patients using their age-adjusted body weight percentiles (<90th and ≥ 90th percentile). Fourth, our findings cannot support a causal mechanism for the increase in body weight, and further studies should evaluate the relevant factors, which include serum lipid levels, ghrelin levels, leptin levels and BMI.

In conclusion, we confirmed that *H. pylori* infection was not associated with obesity among children, although *H. pylori* eradication led to increasing in body weight. However, the limitations of our study preclude us from commenting on the potential causative factors that influenced these results. Therefore, large-scale well-designed the prospective studies are needed to evaluate the association of obesity with *H. pylori* infection and eradication.

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