

Association of *Helicobacter Pylori* Infection and Serum Albumin in Patients on Hemodialysis

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Introduction. *Helicobacter pylori* infection in gastric mucosa may cause systemic inflammatory reaction. We investigated the inflammatory effect of *H pylori* infection on nutritional factors such as serum albumin in hemodialysis patients and influence of eradication of *H pylori* on this association.

Materials and Methods. Ninety-eight patients on hemodialysis were divided into 2 groups according to *H pylori* infection. Eradication of *H pylori*, 8 weeks after treatment, was confirmed by urease breath test and *H pylori* stool antigen. Serum albumin, lipid profile, and metabolite levels were checked before and after 8 weeks and 6 months of eradication of *H pylori*.

Results. Thirty-nine patients (39.8%) were infected with *H pylori*. There were no significant differences between the two groups in age, dialysis duration, serum albumin, serum creatinine, blood urea nitrogen, hemoglobin, serum calcium, serum phosphorus, and lipid profile. Thirty-seven patients with *H pylori* completed the treatment period. Eradication was successful in 30 patients (81.1%). Eight weeks and 6 months after anti-*H pylori* drug therapy, the mean serum albumin level significantly decreased from 4.2 mg/dL to 3.6 mg/dL ($P < .001$) and 3.7 mg/dL ($P < .001$), respectively. Significant decreases were seen in serum cholesterol ($P = .001$), blood urea nitrogen ($P = .005$), and serum calcium level ($P = .03$) and a significant increase in hemoglobin level ($P = .02$).

Conclusions. Our study did not demonstrate nutritional benefits after *H pylori* eradication treatment, as the level of nutritional markers reduced. This relationship needs to be confirmed by further prospective studies.

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INTRODUCTION

Helicobacter pylori infection, which is common in all parts of the world, is associated with many upper gastrointestinal disorders. The prevalence of *H pylori* is between 30% and 80% in different countries. Eradication of this bacterium is known to reduce the histological severity of gastritis and decrease the rate of recurrence of peptic ulcer disease.¹ Patients on hemodialysis frequently

develop gastrointestinal complaints. *Helicobacter pylori* is considered one of the causal factors for these dyspeptic symptoms. Frequency of *H pylori* infection in patients with uremia ranges from 22.5% to 47%.² *Helicobacter pylori* eradication therapy could affect some metabolic, nutritional, and inflammatory factors of hemodialysis patients such as serum albumin. These factors strongly correlate with morbidity and mortality in this

group. The association between *H pylori* infection and serum albumin levels seems to be important to elucidate the relevance of *H pylori* infection with malabsorption and inflammation in hemodialysis patients.

Chronic *H pylori* infection can significantly impact an individual's nutritional status. One study showed that nonuremic *H pylori*-infected individuals displayed a significantly greater frequency of hypoproteinemia compared with the *H pylori*-negative group.³ After *H pylori* eradication, body weight and serum levels of total cholesterol, total protein, and albumin rose significantly. Malnutrition is common among patients with chronic kidney failure. It strongly correlates with morbidity and mortality in this group. In this situation, appropriate dialysis, nutritional support, and treatment of gastrointestinal disorders may reverse the malnutrition. This bacterium can elicit life-long inflammatory and immune responses with release of various bacterial and host-dependent cytotoxic substances,⁴ resulting in chronic gastritis, peptic ulcer, and gastric cancer.⁵ *Helicobacter pylori* infection induces chronic inflammatory and immune responses that can induce lesions in both local and remote sites from the primary infection site.^{6,7}

C-reactive protein (CRP) is an acute-phase reactant that originates from the liver, which has many clinical and biological effects and can be used for the diagnosis and follow-up of various inflammatory and traumatic processes.⁸ There is strong evidence that CRP is a powerful predictor of incident cardiovascular events independent of levels of low-density lipoprotein cholesterol and the metabolic syndrome.^{9,10} Examining the association between *H pylori* infection and serum CRP and albumin levels seems to be important to elucidate the relation of *H pylori* infection with malabsorption and inflammation in hemodialysis patients.

The influence of *H pylori* infection on nutritional status in asymptomatic uremic patients is not known. This study aimed to examine the association between *H pylori* infection and nutritional parameters in hemodialysis patients and the effects of *H pylori* eradication on the nutritional status of this group.

MATERIALS AND METHODS

Patients

Ninety-eight patients on maintenance

hemodialysis (mean, 37.5 months), including 54 men and 44 women, with a mean age of 54.29 years, were selected. Patients with active peptic ulcer, acute gastritis, chronic inflammatory disease, malignancy, amyloidosis, acute infection, or diabetes mellitus were excluded. The hemodialysis protocol for all of the patients was 4 hours using hemophane membranes and an average blood flow rate of 300 mL/min to 350 mL/min. The mean Kt/V for each treatment was 1.2 to 1.4. The patients agreed to participate in the study and signed a written informed consent form.

Methods

To confirm *H pylori* infection, 3 types of tests were used: anti-*H pylori* serology, *H pylori* stool antigen (HPSA), and urease breath test (UBT). Patients who showed 2 positive results from the diagnostic tests of *H pylori* infection were considered to be infected. Accordingly, the patients were divided into 2 groups: 59 patients (26 women and 33 men) who were negative for the infection (group 1) and 39 patients (18 women and 21 men) who were infected by *H pylori* (group 2). Metabolic and nutritional parameters (serum albumin, phosphorus, calcium, cholesterol, triglyceride, and creatinine; blood urea nitrogen [BUN]; and hemoglobin) were compared between the two groups.

Patients in group 2 received a 2-week course of triple-drug eradication therapy with omeprazole, 20 mg twice daily, amoxicillin, 1 g twice daily, and clarithromycin, 250 mg twice daily, followed by a 6-week course of omeprazole, 20 mg twice daily. Eradication of *H pylori* in group 2 was confirmed by UBT and HPSA 8 weeks after treatment. Metabolic and nutritional parameters were checked again 8 weeks and 6 months after the first measurement in group 2.

Statistical Analyses

The data were analyzed using the SPSS software (Statistical Package for the Social Sciences, version 17.0, SPSS Inc, Chicago, Ill, USA). Differences between the two groups were evaluated using the independent sample *t* test, 1-way analysis of variance, and the Kruskal-Wallis test. Changes in nutritional parameters in group 2 after eradication of *H pylori* were evaluated using the paired *t* test. A *P* value less than .05 was considered significant.

RESULTS

Ninety-eight hemodialysis patients enrolled in this study. Serum anti-*H pylori* immunoglobulin G, HPSA, and UBT were performed. The patients were considered *H pylori* positive if 2 out of 3 of the tests were positive; 59 patients (26 women and 33 men) were negative (group 1) and 39 patients (18 women and 21 men) were infected with *H pylori* (group 2). There was not any significant difference between the two groups in age, duration of hemodialysis, serum albumin, serum creatinine, BUN, hemoglobin, serum calcium, serum phosphorus, and lipid profile (Table 1).

Patients in group 2 took the anti-*H pylori* drug regimen and 37 patients completed the treatment period. After 8 weeks, UBT test and HPSA were repeated. Eradication was successful in 30 patients (81.1%), and 7 patients (18.9%) remained positive for *H pylori*. Eight weeks after anti-*H pylori* drug therapy, the mean serum albumin level significantly decreased from 4.2 mg/dL to 3.6 mg/dL ($P < .001$),

and 6 months after the treatment, it decreased to 3.7 mg/dL ($P < .001$). Also, there were significant decreases in serum cholesterol ($P = .001$), BUN ($P = .005$), and serum calcium level ($P = .03$) and a significant increase in hemoglobin level ($P = .02$; Table 2).

DISCUSSION

Malnutrition is common among patients with chronic kidney failure. It is a problem in a large proportion of dialysis population and is associated with an increased morbidity and mortality.¹¹ The several factors that may contribute to this problem include inadequate protein intake, protein degradation and amino acid oxidation due to persistent metabolic acidosis, nausea and vomiting due to uremic toxins and gastroparesis, inadequate dialysis, loss of nutrients in the dialysate, and catabolic processes that occur during dialysis with bioincompatible membranes. In addition, malnutrition may be related to factors such as age, comorbid conditions, and inflammatory and infectious complications. When inflammation and dialysis-related contributions are excluded as possible factors, nutritional intake is the primary cause of malnutrition.

Some investigators have reported that uremia or increased urea concentrations in gastric secretions create a favorable environment for *H pylori* infection, which would explain the higher prevalence in uremic patients.¹² In contrast, Jaspersen and colleagues observed a significantly lower prevalence of *H pylori* infection among patients with chronic uremia than those who were not uremic.¹³ There is a possibility that *H pylori* has nutritional effects.¹⁴ Infection by *H pylori* may cause malabsorption of folate, vitamin B6, and vitamin B12. This nutritional defect could lead to failure

Table 1. Comparison of *Helicobacter Pylori* Seronegative (Group 1) and Seropositive (Group 2) Patients on Hemodialysis*

Variable	Group 1	Group 2	P
Age, y	53.5	55.8	.50
Sex			
Female	28 (43.8)	16 (47.1)	
Male	36 (56.2)	18 (52.9)	.80
Duration of dialysis	35.2	41.9	.30
Serum albumin, mg/dL	4.1	4.2	.40
Serum triglyceride, mg/dL	166	143	.30
Serum cholesterol, mg/dL	176	171	.50
Blood urea nitrogen, mg/dL	83.5	84	.90
Serum creatinine, mg/dL	9.7	9.9	.80
Hemoglobin, g/dL	10.0	10.6	.10
Serum calcium, mg/dL	9.4	9.5	.50
Serum potassium, mg/dL	6.03	6.05	.90

*Values are means except for sex distribution which are frequencies (percents).

Table 2. Mean Values of Nutritional and Inflammatory Factors Before and After Anti-*Helicobacter Pylori* treatment in Patients on Hemodialysis

Parameters	Before treatment	After Treatment			
		8 Weeks	P	6 Months	P
Serum albumin, mg/dL	4.2	3.6	< .001	3.7	< .001
Serum triglyceride, mg/dL	155	140	.23	145	.20
Serum cholesterol, mg/dL	181	161	.001	163	.001
Blood urea nitrogen, mg/dL	87	66	.004	69	.005
Serum creatinine, mg/dL	9.8	9.4	.40	10.1	.40
Hemoglobin, g/dL	10.7	11.5	.04	12.0	.02
Serum calcium, mg/dL	9.6	9.2	.05	9.6	.03
Serum potassium, mg/dL	5.6	5.7	.80	5.6	.80

of methylation by 5-methyl-tetrahydrofolic acid and subsequent hyperhomocysteinemia, which is toxic to endothelial cells.¹⁵ Some recent reports support the possible association between *H pylori* infection and nutritional parameters. In dialysis patients, chronic infections induce overproduction of pro-inflammatory substances and inflammation has been associated with cachexia and anorexia. Infection with *H pylori* is also associated with anorexia, inflammation, and malnutrition in dialysis patients.¹⁶

Baradaran and Nasri found a significant inverse association of *H pylori* infection with serum albumin of hemodialysis patients.¹⁷ Sezer and colleagues claimed that eradication of *H pylori* significantly improved the nutritional status in these cases¹⁸; they detected *H pylori* infection in 10.4% of antral biopsies and chronic gastritis in 63.2%. Among the 103 patients with chronic gastritis, 16.5% had *H pylori* coinfection. When the patients were divided according to biopsy findings, the *H pylori*-positive group showed the poorest nutritional status. These patients had the lowest mean values for serum albumin, serum phosphorus, body mass index, and interdialytic weight gain. The group with chronic gastritis alone had the second poorest nutrition-related results, with lower albumin, phosphorus, and interdialytic weight gain than the group with normal biopsies. On assessing the nutritional parameters of the chronic gastritis-alone and chronic gastritis *H pylori* groups after appropriate treatment, they observed markedly increased values of serum albumin and phosphorus levels in the group that underwent *H pylori* eradication therapy. Their results demonstrate a significant effect of asymptomatic *H pylori* infection on gastrointestinal and nutritional health in hemodialysis patients. They also demonstrate the nutritional benefits of eradicating *H pylori* in this group. The authors believe that the patients' appetite may be restored or improved after elimination of this bacterium, probably leading to improvements in nutritional parameters. Thus, it is important that all hemodialysis patients with malnutrition be investigated for *H pylori* infection.¹⁸

Park and colleagues found that metabolic and inflammatory parameters, including blood glucose, lipid profile, insulin resistance, leukocyte count, and CRP, were not changed after *H pylori* eradication treatment.¹⁹ Torgano and coworkers, however,

showed changes in the serum levels of metabolic parameters were similar between the two groups before eradication of *H pylori*, and significant changes from the baseline in the serum level of albumin, cholesterol, and calcium and levels of BUN and hemoglobin were observed in the group who was infected after eradication of *H pylori*.²⁰

CONCLUSIONS

In this study, we investigated 98 hemodialysis patients. Our aim was to determine the prevalence of *H pylori* infection and its link with the nutritional markers of these patients. We detected *H pylori* infection in 39 patients (39.8%). When the patients were investigated according to tests findings, the *H pylori*-positive group did not show any differences in the nutritional markers compared to the *H pylori*-negative patients. After 8 weeks and 6 months of eradication, we observed markedly decreased values of serum albumin, cholesterol, and calcium and BUN and a significant increase in hemoglobin levels in the group that underwent *H pylori* eradication therapy. In summary, in contrast to evidence which suggests that a successful *H pylori* eradication leads to favorable metabolic changes,^{18,20} our study did not demonstrate the nutritional benefits after *H pylori* eradication treatment, and levels of nutritional markers even reduced. This relationship needs to be confirmed in further prospective studies.

CONFLICT OF INTEREST

None declared.

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