

Does regular garlic intake affect the prevalence of *Helicobacter pylori* in asymptomatic subjects?

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ABSTRACT

Objectives: The in vitro antibacterial activity of garlic against *Helicobacter pylori* (*H.pylori*) is well documented and the potential for its use in vivo was suggested. Garlic intake, a traditional habit by the Taskopru population in Turkey for decades, was examined for its effect on the prevalence of *H.pylori* and compared with the non garlic consuming group.

Methods: Eighty-one garlic consuming asymptomatic subjects in Kastamonu province in Turkey (68 males, 13 females) of 23-82 years of age (average 46) were selected on a very restricted bases in regards to the garlic intake (raw or cooked, or both), amount, duration and other criteria. Control group (non-garlic consuming) of 81 asymptomatic subjects (66 males, 15 females) of 23-90 years of age (average 43) were enrolled for comparison with the garlic consuming group. Serum samples were collected from both groups during the period from September 2001 through to April 2002 and examined by the enzyme linked immunoassay test for anti *H.pylori* antibodies.

Results: An overall *H.pylori* prevalence of 79% and 81% was detected in the garlic and non garlic consuming groups. A significantly lower average antibody titer was detected in the garlic consuming group than that of the control group and similarly in those who consumed mixture of raw plus cooked garlic as compared to those who consumed raw or cooked garlic alone.

Conclusions: Garlic intake for long durations (years) did not appear to have an effect on the prevalence of *H.pylori* infection. Garlic consuming subjects had a significantly lower average antibody titer than non garlic consuming groups, which might suggest an indirect inhibitory effect on the reproduction of *H.pylori* and possibly progression to more serious peptic ulcer diseases.

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Helicobacter pylori is recognized as the causal agent of chronic gastritis, peptic ulcers and as a high risk factor for gastric cancer.¹⁻³ The eradication of *H.pylori* using different antibiotic regimens results in significant remission from these diseases.^{4,5} Attempts to eradicate *H.pylori* by other compounds suggested the use of garlic as a dietary therapy. The antibacterial activity of garlic against *H.pylori* in vitro is well documented. Ohta et al⁶ showed that oil macerated garlic extract (OMGE) contained many anti *H.pylori* compounds with minimum

inhibitory concentrations (MICs) of 10-25 µg/ml and suggested that OMGE should be tested in vivo. Other reports also provided in vitro evidence for anti *H.pylori* effects using aqueous garlic extracts^{1,7-9} commercial garlic tablets⁸ and allyl sulfide components.¹⁰ High intake of Allium vegetables including garlic was reported to reduce the risk of gastric cancer.^{11,12} Others showed a reciprocal relationship between stomach cancers, strongly correlated with *H.pylori* infection, and the consumption of Allium vegetables.^{11,13} These reports

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suggest that garlic and garlic materials might provide a suitable basis for new anti *H.pylori* therapies as they possess well established anti-microbial actions^{6,9,14,15} and the chemical complexity of garlic materials and their broad spectrum effectiveness suggests that acquired antibiotic resistance would be unlikely. In addition, direct intragastric effects are feasible as garlic anti-microbials are unaffected by acid environments.¹⁵ We attempted to evaluate the long term in vivo effect of garlic intake on the prevalence of *H.pylori*. The best candidates that we found for such an evaluation were the asymptomatic subjects from Taskopru (small garlic farming town in Kastamonu province in Turkey). It is famous for its garlic quality and production (18,000 tons/year) and people are being used to promote this production in their annual garlic festivals. The traditional habit of garlic intake by this population has been well established from decades ago.

Methods. Eighty-one garlic consuming asymptomatic subjects from the Taskopru population in Kastamonu province in Turkey (68 males, 13 females) of 23-82 years of age (average 46) were enrolled in this study. The majority (72%) were farmers and the rest were workers and housewives of farmers. They were generally of low socioeconomic and educational status. The enrollment of subjects was undertaken on very restricted bases in collaboration with the municipal authorities and the official doctor. At the beginning subjects were given a free physical examination then a questionnaire form was filled in a systematic order regarding age, birthplace, residency, antibiotic intake, history of abdominal pain, marital status, education, socioeconomic status, smoking, and lastly garlic consumption habit. Each subject was interviewed independently without being informed regarding the study. Subjects who did not fit the criteria set below were excluded even before they were asked regarding their garlic consumption habit. Excluded were subjects who were not born or lived in Taskopru for their entire life, those who were on antibiotic treatment during the last 6 months, those with history of continuous abdominal pain or previous upper gastroendoscopy and those who consumed less than one clove of garlic weekly. The garlic consumption criteria were based upon the intake of garlic (raw or cooked, or both), the weekly amount consumed (one or more cloves/week) and the duration (regular consumption for >5 years). Control group (non-garlic consuming) of 81 asymptomatic subjects (66 males, 15 females) of 23-90 years of age (average 43) who did not consume garlic were enrolled for comparison with the garlic consuming group. They were blood donor volunteers, health workers and housewives from 6 other provinces in Turkey. Subjects had no previous history of abdominal pain or upper gastroendoscopy and were not on antibiotic treatment during the last 6 months. To match the age and male to female ratio to the garlic consuming

Table 1 - Prevalence of *H.pylori* in garlic and non-garlic consuming subjects as detected by the enzyme linked immunoassay.

Subject group	<i>H.pylori</i> +	
	Total (%)	Gender (%)
Garlic consuming n=81	64 (79)	M:55 (86) F: 9 (14)
Non garlic consuming n=81	66 (81)	M:52 (79) F: 14 (21)
M - male, F - female		

Table 2 - Average anti *H.pylori* antibody titers in garlic consuming subjects according to their intake pattern.

Garlic consumption	<i>H.pylori</i> + (%)	Average antibody titer (95% CI)
Raw (n=43)	33 (77)	4.89 (4,42-5,35)
Cooked (n=24)	21 (88)	4.88 (4,41,5,35)
Raw and cooked (n=14)	10 (71)	3.72 (3,02-4,44)
p<0.05, CI - confidence interval		

group, the selection of this group was made out of 200 asymptomatic subjects enrolled by using Microsoft Excel 2000 software program "RAND worksheet function." Blood from both groups for serum sample was collected during the period from September 2001 through to April 2002.

Enzyme immunoassay. The enzyme linked immunoassay kit, SIA-*Helicobacter pylori* enzyme immunoassay (Sigma, United States of America) was used for qualitative and semi-quantitative determination of immunoglobulin G (IgG) anti *H.pylori* antibodies as specified by the instruction manual. All samples were tested at the same time.

Statistical analysis. Data was analyzed using statistical package for social sciences 10.1. The difference between the groups was carried out using analysis of variance, Chi-square and t test. A p value of <0.05 was considered to be statistically significant.

Results. The habit of garlic consumption although unique to the Taskopru population, verification of such consumption by the selected group was carried out by interviewing several hundreds subjects. Out of 493 subjects interviewed independently, only 81 did fit the set up criteria for garlic consumption. Contacting a spouse or a household member immediately following the interview did an independent verification of the

garlic consumption habit by each subject. Matching of the age and male to female ratio showed no significant difference between the 2 groups. Subjects were consuming garlic for a duration that varied between 5 and 50 years with the majority being started at young ages. These subjects consume an average of 1.326 kg garlic/year. Garlic intake of fresh raw clove alone was a habit of 43 (53%), cooked of 24 (30%) and mixture of raw plus cooked of 14 (17%) of the 81 subjects. *Helicobacter pylori* was prevalent in 64 (79%) of 81 garlic consuming subjects examined, 55 (86%) were males and 9 (14%) were females (Table 1). The non garlic consuming subjects showed a prevalence of *H.pylori* in 66 (81%) of 81 examined, 52 (79%) were males and 14 (21%) were females (Table 1). There was a significant difference in the average anti *H.pylori* antibody titer that is lower in the garlic consuming subjects of 4,70 (95% confidence interval (CI): 4,40-5,01) as compared to the non garlic consuming subjects of 5,50 (95% confidence interval: 5,02-5,99). A significant difference in the average antibody titer was also found in the pattern of garlic intake that is lower in those who consumed mixture of raw plus cooked garlic as compared to those who consumed raw or cooked garlic alone (Table 2).

Discussion. The prevalence of *H.pylori* infection is well known to be high worldwide. Over 50% of the world population are reported to be infected with a rate of 25% in developed countries and >90% in developing countries.^{16,17} The detection of such infections is usually carried out by serology using the enzyme linked immunoassay test, which is most widely used in epidemiological and post treatment studies.¹⁸⁻²⁰ The test is also used for monitoring infections in dyspeptic and gastric cancer subjects.^{2,18,21} A serological test is cheap and reliable method for monitoring success of eradication of *H.pylori* in which the fall of specific IgG antibody titers can be followed quantitatively. Immunoglobulin G titers were shown to fall by 20-30% 6 weeks after treatment of *H.pylori* and decreased to 50% or less at 6 and 12 months.^{22,23} A 40-50% decrease of antibody titers within 5-6 months continues and reaches normal titers within 2 years.¹⁹ Since no previous measurement of *H.pylori* specific antibody titers following garlic intake was being published, subjects consuming garlic for <5 years were excluded from this study.

The enzyme linked immunoassay kit used in this study has been validated earlier in our laboratory; the results obtained were compared to those of the biopsy-based tests (CLO, culture, histology), and the test showed 89% sensitivity (95% CI, 81.5-95.5%), 100% specificity, 100% positive predictive value and 67% negative predictive value (95% CI, 55.5-78.3%).²⁴ In our recent studies on asymptomatic subjects from Turkey and Libya, we detected 64% and 76% prevalence rates.^{24,25} Such high percentages are also detected in this

study in which no significant difference was obtained between the garlic consuming and the non garlic consuming subjects. In these studies, factors such as education and low socioeconomic status were found to play a significant role in the acquisition of *H.pylori*. Garlic is considered an important dietary component in the Mediterranean countries and also in both Italy and China.²⁶ It has been reported that the use of fresh raw garlic is advantageous over cooked one since heat treatment of extracts was shown to reduce the inhibitory or bactericidal activity against *H.pylori* in vitro.⁷ The boiled garlic extract lost efficacy from 2-4 folds. The values of MIC and the minimum bactericidal concentrations obtained with fresh aqueous garlic extract.⁷ In this study, the pattern of garlic intake did not appear to have an effect on the prevalence of *H.pylori*, but there was a significant difference in the average anti *H.pylori* antibody titer that is lower in those who consumed mixture of raw plus cooked garlic than those who consumed raw or cooked garlic alone. Such a difference might be attributed to the increase in the amount of garlic consumed by the earlier group.

In the literature, there is no established report on how much is the amount and how long is the duration of garlic intake that is effective against *H.pylori*. Graham et al²⁷ in their study on 12 *H.pylori* infected subjects gave fresh garlic to 10-, fresh jalapeno pepper to 6- and Bismuth to 11 subjects with meal on 3 separate days. They reported that neither garlic nor jalapeno had any inhibitory effect on *H.pylori*, but bismuth had. In a more recent study, 5 dyspeptic patients were treated with garlic oil capsules (4 times/day) for 14 days and the results showed neither eradication nor suppression of *H.pylori* or symptoms.²⁶ You et al²⁸ performed a dietary interview and measurement of serum *H.pylori* antibody on a group of asymptomatic subjects from garlic farming town in Cangshan country of Shandong Province in China. According to the questionnaire, subjects were divided into 3 groups based on the amount of garlic consumed/year. No significant difference was recorded among these groups and in overall 55% of the subjects had positive serum antibodies to *H.pylori*. They concluded that a weak inverse relationship was found between garlic and *H.pylori* infection and that garlic might be protective, in the development and progression of the disease. In Turkey, Aydin et al²⁹ treated 20 *H.pylori*-positive dyspeptic patients with either garlic oil alone (n=10) or garlic oil plus omeprazole (n=10) for 2 weeks. No effect was recorded on either the prevalence of *H.pylori* or the grading of gastritis. From the former in vivo studies, It appeared that garlic had no inhibitory effect on *H.pylori* when used for the specified periods of time and thus, all reports were negative. In addition, Mahady and Pendland³⁰ in response to the Graham et al²⁷ study indicated that generally, the therapeutic effects of botanicals appear to be due to cumulative effects, and may take 8-12 weeks before any benefits are observed. In this regard, the garlic intake pattern by our selected subjects seemed to cover these issues.

In our study, it appeared that regular garlic intake even for very long durations did not affect the prevalence of *H.pylori* infection in the population examined. Comparison of this group with the non garlic consuming group does support this observation. However, garlic consuming subjects had a significantly lower average anti *H.pylori* antibody titer than non garlic consuming group, which might suggest that garlic intake might exert an indirect inhibitory effect on the reproduction of *H.pylori* and possibly progression of such infection to more serious peptic ulcer disease or gastric cancer. It will be of interest to follow these subjects 5 years from now to look for any progression to a more serious outcome and changes in the antibody titers.

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