ORIGINAL ARTICLE

# The Effect of Bacterial Infection with *Helicobacter pylori* on Thyroid Hormones

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## ABSTRACT

**Objective:** Our current research aimed to see if there was a link between *Helicobacter pylori* infection and thyroid hormone levels.

**Methods:** In Karbala, Iraq, samples were obtained from 84 individuals with *H. pylori* (42 patients tested positive for *H. pylori* antigen test and 42 patients tested negative) between December 2021 and January 2022. All subjects had five milliliters of whole blood drawn into clot tubes and centrifuged for 30 minutes to obtain serum. Enzyme-linked immunosorbent assay (ELISA) kits were used to measure the amounts of free T4 and TSH in the blood.

**Results:** Females are more susceptible to *H. pylori* infection than males ($p = 0.00001$), according to the findings. Furthermore, the mean age of positive test patients is 49.66 years, which is considerably ($p = 0.0177$) higher than the mean age of negative test patients (43.38 years), and the oldest men are more infected with *H. pylori* than young men.

The results show no significant variations in free T4 concentrations between males and females for both positive and negative tests ($p > 0.05$). This implies that while infected with *H. pylori*, the concentration of free T4 was unaffected. Finally, *H. pylori* infection causes a considerable increase in stomach acid, according to the research. ($p = 0.0037$) in FSH levels in both sexes.

**Conclusions:** We can determine that females are more likely than males to be infected with *H. pylori*. And that most patients are aged, particularly men. Furthermore, there is no partnership between *H. pylori* infection and free F4 hormone levels, and patients with *H. pylori* have a higher FSH hormone concentration than those with a negative *H. pylori* antigen test.

**Keywords:** free$T_4$, FSH, *H. pylori*, Kerbala.

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## INTRODUCTION

*Helicobacter pylori* is a gram-negative circle pathogenic bacteria that commonly infects and destroys the stomach's mucosa. H. pylori infections can cause chronic gastritis, peptic ulcers, and stomach cancer, among other things.[1,2] Extragastric illnesses can also be caused by *H. pylori* infection. According to preliminary findings, Extragastric diseases like as prediabetes have been linked to *H. pylori* infection,[3] Insulin resistance (IR),[4] diabetic mellitus,[5] and nonalcoholic fatty liver disease (NAFLD).[6] Furthermore, several studies have found a link between autoimmune thyroid disorders (ATDs) and *H. pylori* infections.[7-9] Indeed, research has revealed that certain bacteria and viruses can mimic the pathogenic nature of the thyroid phospholipid bilayer, a significant factor in the evolution of autoimmune diseases.[10-13] As a result, autoantibodies may assault the thyroid after *H. pylori* infection.

In previous research, there has been some indication of a relationship between thyroid autoimmune disorders and *H. pylori* infection, such as Graves' disease and Hashimoto thyroiditis. However, studies have examined the relationship between *H. pylori* infection and thyroid ailments, which has mostly emphasized thyroid autoimmunity.[14-16] *H. pylori* infection was revealed to be positively linked with the risk of thyroid nodule (TN) types by Shen *et al*.[17] Molecular mimicry and dysbiosis are two biological mechanisms that have been proposed to explain the link.[18-20] According to molecular mimicry theory, At least 14 *H. pylori* antigen epitope proteins have amino acid sequences identical to those found in thyroid innate proteins.[14] This anatomical resemblance can result in an immune cross-reaction and long-term thyroid dysfunction, which could explain why *H. pylori* infection causes reactive hyperplasia.[3] $T_h$ cells may serve other purposes in this process by co-inducing the development of TN types.[3,19] Furthermore, Endocrine signals are influenced by the brain-gut axis, and TN patients' intestinal microbiota diversity is substantially higher than the normal population.[18] *Lactobacillus*, an important

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intestinal flora, has been identified to prevent oxidative stress to the thyroid gland, whereas infection with *H. pylori* reduces the bacterium's ability to survive, which could be linked to the pathogenesis of TN types.[18,21] Although these data suggest links and possible physiological mechanisms, large population epidemiological studies are still needed to confirm them.

Either *Helicobacter pylori* or peptic ulcer disease cause gastritis, or sometimes both. On the other hand, gastritis required higher daily dosages of T4 than healthy, implying that normal stomach acid output is essential for successful oral T4 absorption.[22] Furthermore, in people were treated with T4, the formation of *H. pylori* infection led in a rise in serum thyrotropin (TSH), an influence that was almost completely reversed once *H. pylori* infection was eliminated.[22]

In this study, we looked at the link between *H. pylori* infection and thyroid hormones (free F4 and FSH) in the city of Karbala.

## MATERIALS AND METHODS

In this study, by using ELISA kits, H. pylori antigen (in stool) was assessed as a marker of *H. pylori* infection. Samples from 84 patients (42 patients were positive *H. pylori* antigen and 42 patients were negative *H. pylori* antigen) were obtained.

All subjects had five milliliters of whole blood drawn into clot tubes and centrifuged for 30 minutes to obtain serum. Thyroid function was assessed using ELISA kits that evaluated free T4 and TSH levels in the blood.

## RESULTS AND DISCUSSION

*Gender:* The results in Table 1 indicate no significant difference ($p > 0.05$) between patients whose results appeared positive for *H. pylori* antigen test and those who tested negative for both sexes.

While there was a significant and clear increase ($p = 0.00001$) in the number of test-positive females compared to the number of test-positive males was found, which indicates that females are more susceptible to infection with *H. pylori* than males.

The current study's findings were consistent with those of Yücel *et al.,*[23] who discovered that the percentage of females was higher than that of males (76% of them were female and 24% male). Another study found a substantial link between female gender and GN, as well as a link between higher GC grade and female gender.[24] Also, females had a higher prevalence of *H. pylori* infection than males.[25]

On the other hand, our findings differed from those of numerous other investigations. The male gender is linked to the majority of *H. pylori*-related illnesses. De Martel and Parsonnet examined the effect of sex as a disease risk for *H. pylori* infection in a schema of large, inhabitants research.[26] Male sex was found to be infected with *H. pylori* is strongly linked (OR: 1.16, 95% CI: 1.11-1.22), and this male superiority of *H. pylori* infection was consistent across older adults from various countries.

Although male gender is linked to most *H. pylori*-related disorders, gender's role as a predictive marker for *H. pylori* infection is indeed debated. To find the actual *H. pylori* and sex have a connection, the researchers employed a meta-analysis of large, society studies where the test of conversation had been suited at least for age and socioeconomic factors, and accumulated actual data from researchers once data on sex correlations was not initiated.[26]

*Age:* The results of Table 2 found that the average age of patients for positive test is 49.66 years, which is significantly ($p = 0.0177$) more than the average for patients with a negative test (43.38 years). The findings also revealed no statistically significant difference($p > 0.05$) between the mean ages of males and females for both test results.

It should be noted that the average age of males whose test result was positive was 54.66 years, which is significantly higher ($p = 0.0409$) than the average age of males whose test result was negative (38.71 years), and this indicates that the oldest men are more infected with *H. pylori* than young men.

In contrast to our findings, one study observed that the mean age of participants with thyroid nodules was greater than that of the control group (43 and 50 years, respectively) in one study.[17] Individuals under 50 years old had a substantially larger proportion of *H. pylori* positive + CAP than those over 50 years old (87/250; 34.8% versus 32/65; 49.2 percent) ($p = 0.033$).[27] Another study found that the average age (SD) was 42.95. (16.32).[28]

According to the findings of the Hong *et al* study, In individuals under 36 years old, a higher the rise in adulthood linked to a higher incidence of *H. pylori* infection, with a maximum at 36 years of age. Infection with *H. pylori* did not increase substantially with age in patients older than 36 years.[25]

*Free $T_4$:* The concentration of free $T_4$ in the test-negative patients was 1.67 ng/dL, while its concentration decreased insignificantly ($p = 0.2705$) in the test-positive patients, as its concentration was 1.22 ng/dL. The table implies that no substantial differences exist ($p > 0.05$) in the concentration of free $T_4$ between females

**Table 1:** Distribution of *H. pylori* patients according to sex.

| | *H. pylori antigen test* | | |
|---|---|---|---|
| *Sex* | *Negative N(%)* | *Positive N(%)* | *p-value* |
| Female | 28 (66.7 %) | 36 (85.7%) | 0.31731 |
| Male | 14 (33.3 %) | 6 (14.3%) | 0.07364 |
| Total | 42 (100 %) | 42 (100%) | 1.0000 |
| p-value | 0.03075 * | 0.00001 ** | |

* denotes meaningful statistically differences ($P < 0.05$). ** identifies substantial variations ($p < 0.001$).

**Table 2:** The age of *H. pylori* patients.

| | *H. pylori antigen test* | | |
|---|---|---|---|
| *Sex* | *Negative (Mean±SD) Years* | *Positive (Mean±SD) Years* | *p-value* |
| Female | 45.71 ± 11.92 | 48.83 ± 9.51 | 0.2484 |
| Male | 38.71 ± 9.12 | 54.66 ± 24.02 | 0.0409 * |
| Total | 43.38 ± 11.45 | 49.66 ± 12.32 | 0.0177 * |
| P value | 0.0609 | 0.2888 | |

* denotes meaningful statistically differences ($P < 0.05$). ** identifies substantial variations ($p < 0.001$).

**Table 3:** Free T4 concentration (ng/dL) of *H. pylori* patients.

| | *H. pylori antigen test* | | |
|---|---|---|---|
| *Sex* | *Negative (Mean ± SD)* | *Positive (Mean ± SD)* | *p-value* |
| Female | 1.92 ± 3.16 | 1.17 ± 0.38 | 0.1623 |
| Male | 1.19 ± 0.27 | 1.50 ± 0.73 | 0.1732 |
| Total | 1.67 ± 2.59 | 1.22 ± 0.45 | 0.2705 |
| P value | 0.3963 | 0.0962 | |

* denotes meaningful statistically differences ($p < 0.05$). ** identifies substantial variations ($p < 0.001$).

**Table 4:** FSH concentration (µIU/ml) of *H. pylori* patients.

| | *H. pylori antigen test* | | |
|---|---|---|---|
| *Sex* | *Negative (Mean ± SD)* | *Positive (Mean ± SD)* | *p-value* |
| Female | 1.31 ± 1.30 | 6.28 ± 11.45 | 0.0260 * |
| Male | 1.03 ± 0.55 | 6.24 ± 7.63 | 0.0167 * |
| Total | 1.22 ± 1.11 | 6.27 ± 10.91 | 0.0037 * |
| P value | 0.4467 | 0.9935 | |

* denotes meaningful statistically differences ($p < 0.05$). ** identifies substantial variations ($p < 0.001$).

for both positive and negative tests, as well as for males. This result (Table 3) indicates that the concentration of free $T_4$ was not affected when infected with *H. pylori*.

Our findings are consistent with those of several other studies. There was a negative connection between *H. pylori* Ab titer and free T4 in one investigation.[29]

The current study contradicted the findings of Triantafillidis *et al.*, finding significant differences in FreeT4 (1.04 0.2 vs. 1.17 0.3 ng/dL, $p = 0.025$) between persons positive and negative for *H. pylori* infection.[30]

*FSH:* The results in Table 4 showed that infection with bacteria leads to a significant increase in the concentration of FSH. Whereas the concentration of FSH when the test result is negative is 1.22 µIU/mL, and this concentration increased significantly ($p = 0.0037$) in patients infected with *H. pylori*.

When comparing the uninfected females with the infected, there is a significant increase ($p = 0.0260$) in the concentration of FSH, as its concentration was (1.31 and 6.28) µIU/mL, respectively. Likewise, when comparing the uninfected males with the infected, there is a significant increase ($p = 0.0167$) in the concentration of FSH, as its concentration was (1.03 and 6.24) µIU/mL, respectively.

The *H. pylori* Ab titer and TSH had a significant positive connection.[29] According to the findings of one investigation, In the euthyroid population, *H. pylori* infection has been associated to thyroid nodules. Nevertheless, it's a shame that the study didn't include the number and size of thyroid nodules in all patients since it's an annual health assessment, some data on the size and number of thyroid nodules were wrongly recorded. In several studies, TSH was inversely associated with the risk of thyroid nodules, which could be due to the insulin pathway.[17]

## CONCLUSIONS

Through what was reached in this study, it can be concluded that females are more infected with *H. pylori* than males. And the patients with *H. pylori* are old, especially in males. Also, there seems to be no connection between people infected with *H. pylori* and concentrations of free F4 hormone, and on the contrary, patients with *H. pylori* have a higher concentration of FSH hormone compared negative *H. pylori* antigen test.

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