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Investigating the Relation between *Helicobacter pylori* and Thyroid diseases

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Abstract

This review intends to focus on the relationship between *Helicobacter pylori* (*H. pylori*) infection and different thyroid disorders. *H. pylori* infection is the top global infectious disease. More than half of the world's populations are affected by *H. pylori.* It is the cause of chronic gastritis, peptic ulcer, and, consequently, gastric malignancies if not treated. Infection with *H. pylori* provokes a chronic cellular inflammatory response in gastric mucosa. Nonetheless, the impacts of *H. pylori* local infection may not only related to the digestive tract but may involve extra-intestinal tissues and organs. *H. pylori* infection is reported to be linked to conditions and diseases outside the digestive system. Various endocrine disorders, such as thyroid diseases, diabetes mellitus, dyslipidemia, obesity, osteoporosis, and primary hyperparathyroidism, were reported to be related to *H. pylori* infection.

Keywords: *Helicobacter pylori*, Thyroid diseases, TSH.

Introduction

H. pylori is a spiral-shaped, gram-negative pathogenic bacterium. It is explicitly colonized in the gastric epithelium, leading to chronic gastritis, peptic ulcer disease, and gastric malignancies (1). *H. pylori* infection initiated an acute polymorphonuclear infiltration in gastric mucosa. Untreated and uncleared infection gradually converts acute cellular infiltrate to chronic immunologically mediated predominantly mononuclear cellular infiltrate (2). It is characterized by local production and systemic diffusion of proinflammatory cytokines (3) that may release their effect in remote tissues and organic systems (4).As a result, *H. pylori* infection has been epidemiologically linked to some extra-digestive conditions, including endocrine disorders, Autoimmune thyroid diseases, Autoimmune atrophic thyroiditis, Hashimoto's thyroiditis, Thyroid mucosal-associated lymphocyte tissue (MALT) lymphoma, Diabetes mellitus, Dyslipidemia, Obesity, Osteoporosis, Primary hyperparathyroidism.

However, there are contradictory data regarding the relationship between *H. pylori* infection and these diseases (5).

Thyroid diseases

Thyroid disease is a subset of endocrinology, one of the most misunderstood and undiagnosed diseases (6).Thyroid gland diseases are among the most prevalent endocrine disorders in the world, second only to diabetes, according to the World Health Organization. Hyperfunction hyperthyroidism and hypothyroidism affect about 2% and 1% of individuals, respectively (7). Men have about a tenth of the prevalence of women. Hyper and hypothyroidism may be caused by thyroid gland dysfunction, secondary to pituitary gland failure, or tertiary to hypothalamic malfunction. Due to dietary iodine deficiency, goiter or active thyroid nodules may become prevalent in some regions, with a prevalence of up to 15%. The thyroid gland can also be the location of different kinds of tumors and a dangerous place where endogenous antibodies wreak havoc (autoantibodies) (8).

H. pylori and thyroid gland disorders

H. pylori infection has been associated causally with a diverse spectrum of extra-gastric disorders, including iron deficiency anaemia, chronic immune thrombocytopenic purpura, growth retardation, and diabetes mellitus (9). The infection may also be involved in the pathogenesis of autoimmune thyroid disease (ATD), including Hashimoto thyroiditis (HT) and Graves' disease (GD), the significant causes of hypothyroidism and hyperthyroidism, respectively (10).The mechanism is thought to be linked to molecular mimicry between *H. pylori* antigens and thyroid constituents (11). Furthermore, the association is more robust in patients infected with CagA-positive strains (Figure. 1), which may be linked to cross reactivity between antibodies against *H. pylori* CagA protein and follicular cells of the thyroid gland (12). The fact that *H. pylori* eradication leads to decreasing levels of thyroid autoantibodies reinforces the putative role of the infection in ATD (13).

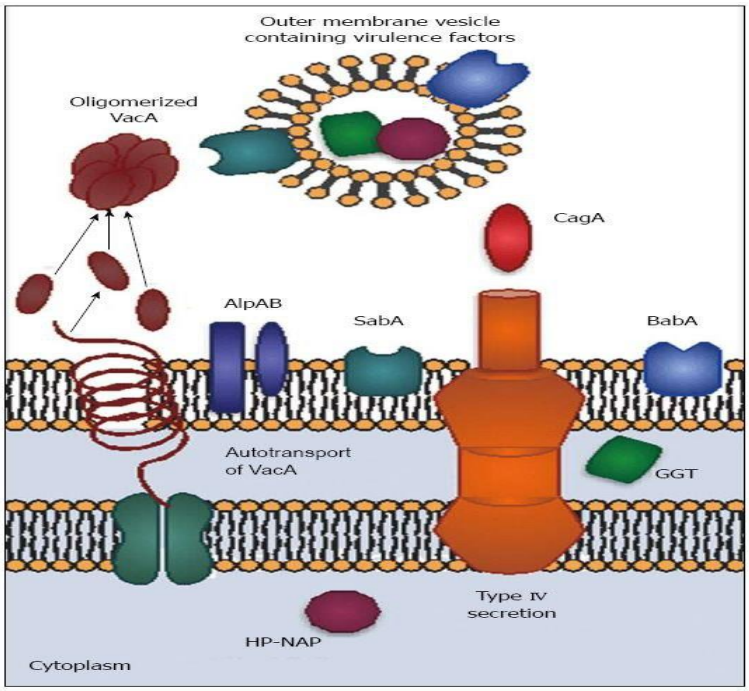

Figure. 1: Virulence factor of *H.pylori* (14)

Furthermore, the association is more robust in patients infected with CagA-positive strains that may be linked to cross reactivity between antibodies against *H. pylori* CagA protein and thyroid gland follicular cells (14). The fact that *H. pylori* eradication leads to decreasing levels of thyroid autoantibodies reinforces the putative role of the infection in ATD (15). However, only one study evaluated *H. pylori* status in children with ATD (16). In addition, no awareness was given to the studies on *H. pylori* infection in children with other thyroid diseases.

H. Pylori and Autoimmune Thyroid Disease

The commonly occurring Autoimmune Thyroid Diseases (AITD) or Thyroiditis are Grave's Disease (GD), Hashimoto's thyroiditis (HT), Atrophic Thyroiditis (AT), Painless Thyroiditis (PT) or Silent Thyroiditis (ST), Subacute Lymphocytic Thyroiditis (SLT), or Postpartum Thyroiditis (PPT) (17).The presence of autoantibodies against Thyroglobulin (TgAbs), TPO-Ab, and Thyrotropin Receptor (TRAbs) was a typical marker of GD and HT. The pathogenesis of Grave's Disease (GD) and Hashimoto's Thyroiditis (HT) is nearly the same, in which the autoantibodies act against Thyroglobulin (TgAbs), Thyroperoxidase (TPO-Abs) and Thyrotropin Receptor (TRAbs) (18).Autoimmune thyroid disease is said to be caused by genetic and environmental factors (Figure.2).

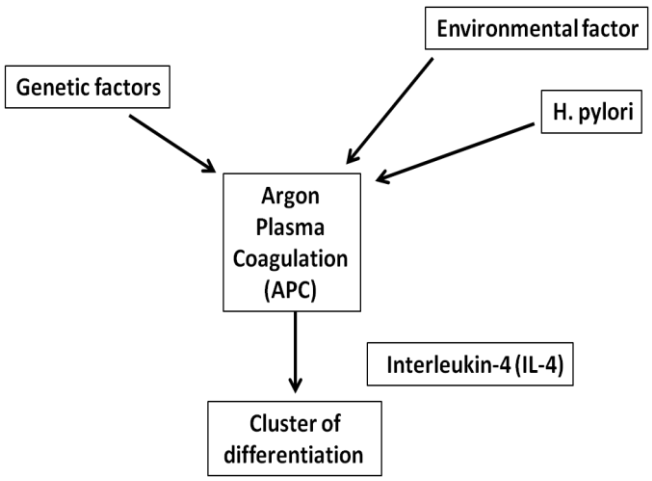

Figure. 2. The role of *H. pylori* is showed for the commencement of Grave's Disease (20).

The *H. pylori* bacteria mirror the antigen in the thyroid cells and play a major role in the onset of AITDs. According to the published data , the *H. pylori* bacteria have predominantly affected people in third-world countries. Its presence was profound in older people. It proliferates with age in some people. Apart from being the causative factor for the commencement of AITDs, these motile bacteria also cause diseases related to the abdomen, such as ulcers (gastroduodenal ulcers), gastritis, and carcinoma. An individual tends to get autoimmune thyroiditis for a combination of reasons given, like a woman at a middle-aged, an individual suffering from any other autoimmune disorders like Lupus, Type 1 diabetes, or Rheumatoid arthritis, or a person having autoimmune thyroiditis related to environmental radiation (19).

Antibodies to *H. pylori* were identified during the first diagnosis in patients affected by Autoimmune Thyroid Disease. In patients having Turner Syndrome, serology for *H. pylori*

was assessed in cases without thyroid autoimmunity and well before the emergence of autoantibodies. Moreover, it has been proved that *H. pylori* infection can bring about autoimmune processes against mucosa, resulting in autoimmune gastritis. Also, *H. pylori* is believed to be involved in the pathogenesis of non-gastrointestinal conditions, including rosacea, ischemic heart disease, and Type 1 diabetes. Finally, *H. pylori* infection is seen in most of the adult AITD patients (20).

Gastric mucosa that contains glands and gastric pits is the primary target of *Helicobacter pylori* groups and destroys surface epithelium and brings about a chronic inflammatory reaction in lamina propria, a thin layer of loose connective tissue that lies beneath the epithelium. Lamina propria and epithelium collectively constitute mucosa. Gland atrophy and intestinal metaplasia are two of the long-term consequences of this process. *H. pylori* prompts antibodies that cross-react with epithelial components of gastric mucosa, periglandula T cells, and elevated glandular cell apoptosis that might bring about diffuse, restricted corpus fundus and atrophic gastritis of autoimmune type. Some of the clinical consequences of *H. pylori* include Achlorhydria with secondary hypergastrinemia, with or without pernicious anemia, and elevated risk for gastric enterochromaffin (21)

Conclusion

The current study revealed various studies that evaluate *H pylori's* potential direct or indirect involvement in the pathogenesis of various extra-gastric diseases or disorders like disorders of the endocrine system spatially thyroid diseases. However, the causal association between *H pylori* infection and thyroid gland disorders remains controversial. Regardless, the authors believe that it deserves another study since these diseases affect many people and significantly impact human health and economics.

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Ethics statement

All authors approved that this research follows the journal's ethical guidelines as appeared on the journal's author guidelines page.

Author contributions

Conceptualization, software, methodology, formal analysis, validation., investigation, resources, data curation, writing—original draft preparation, writing—review & editing ; Qasim A.J. visualization, supervision, project administration, funding acquisition ;

Zeadan; A. M. Both authors have read and agreed to the published version of the manuscript.

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References

1. Wotherspoon AC, Ortiz-Hidalgo C, Falzon MR, Isaacson PG. *Helicobacter pylori*-associated gastritis and primary B-cell gastric lymphoma. Lancet. 1991; 338: 1175-1176.
2. Parsonnet J. *Helicobacter pylori* and gastric cancer. Gastroenterol Clin North Am. 1993; 22: 89-104.
3. Graham DY, Osato MS, Olson CA, Zhang J, Figura N. Effect of *H. pylori* infection and CagA status on leukocyte counts and liver function tests: extra-gastric manifestations of H. pylori infection. Helicobacter. 1998; 3: 174-178.
4. Perri F, Clemente R, Festa V, De Ambrosio CC, Quitadamo M, Fusillo M, Grossi E, Andriulli A. Serum tumour necrosis factor-alpha is increased in patients with *Helicobacter pylori* infection and CagA antibodies. Ital J Gastroenterol Hepatol. 1999; 31: 290-294.
5. Patel P, Mendall MA, Khulusi S, Northfield TC, Strachan DP. *Helicobacter pylori* infection in childhood: risk factors and effect on growth. BMJ. 1994; 309: 1119-1123.
6. Azar, a.T, Hassanien, A.E. and Kim, T. Expert system based on neural fuzzy rules for thyroid diseases diagnosis, Computer Science, Artificial Intelligence, arXiv. 2012;1403.0522:1-12.
7. A.C.C.Heuck, "World Health Organization," 2000. Available: https://www.who.int/
8. Santos MLC, Brito BB, da Silva FA, Sampaio MM, Marques HS. Oliveira e Silva N, et al. *Helicobacter pylori* infection: beyond gastric manifestations. World J Gastroenterol. 2020; 26:4076–93. doi: 10.3748/wjg.v26.i28.4076
9. Figura N, Di Cairano G, Lorè F, Guarino E, Gragnoli A, Cataldo D, et al. The infection by *Helicobacter pylori* strains expressing CagA is highly prevalent in women with autoimmune thyroid disorders. J Physiol Pharmacol. 1999;50:817–26.
10. Bassi V, Marino G, Lengo A, Fattoruso O, Santinelli C. Autoimmune thyroid diseases and *Helicobacter pylori*: the correlation is present only in Graves's disease. World J Gastroenterol. 2012;18:1093–7. doi: 10.3748/wjg.v18.i10.1093.
11. Figura N, Di Cairano G, Moretti E, Lacoponi F, Santucci A, Bernardini G, et al. *Helicobacter pylori* infection and autoimmune thyroid diseases: the role of virulent strains. Antibiotics. 2019; 9:12. doi: 10.3390/antibiotics9010012
12. Bertalot G, Montresor G, Tampieri M, Spasiano A, Pedroni M, Milanesi B, et al. Decrease in thyroid autoantibodies after eradication of *Helicobacter pylori* infection. Clin Endocrinol. (2004) 61:650–2. doi: 10.1111/j.1365-2265.2004.02137.x.
13. Larizza D, Calcaterra V, Martinetti M, Negrini R, De Silvestri A, Cisternino M, et al. *Helicobacter pylori* infection and autoimmune thyroid disease in young patients: the disadvantage of carrying the human leukocyte antigen-DRB1∗ 0301 allele. J Clin Endocrinol Metab. 2006; 91:176–9. doi: 10.1210/jc.2005-1272.
14. Wei-Jia Shi Wei Liu, Xiao-Ying Zhou, Feng Ye, Guo-Xin Zhang. Associations of *Helicobacter pylori* infection and cytotoxin-associated gene A status with autoimmune

thyroid diseases: a meta-analysis. Thyroid. 2013 ; 23(10): 1294–1300. Published online. 2013 Sep 11. doi: 10.1089/thy.2012.0630.

15. Kowalski M. *Helicobacter pylori* (*H. pylori*) infection in coronary artery disease: influence of *H. pylori* eradication on coronary artery lumen after percutaneous transluminal coronary angioplasty. The detection of *H. pylori* specific DNA in human coronary atherosclerotic plaque. J Physiol Pharmacol. 2001;52(1 Suppl 1):3-31.
16. Trikudanathan G. Philip A. Dasanu C A. Baker WL.Association between *Helicobacter pylori* infection and pancreatic cancer. A cumulative meta-analysis. JOP. 2011; 5;12(1):26-31.
17. Bassi V. Marino G. Iengo A. Fattoruso O. Santinelli C. Autoimmune thyroid diseases and *Helicobacter pylori*: the correlation is present only in Grave's disease. World J Gastroenterol. 2012;18:1093– 1097.
18. Balázs C. The role of hereditary and environmental factors in autoimmune thyroid diseases. Article in Hungarian. Orv Hetil. 2012;153:1013–22.
19. Tomer Y. Davies TF. Infection, thyroid disease, and autoimmunity. Endocr Rev. 1993;14:107–120.
20. Shi W J. Liu W. Zhou X Y Ye F. Zhang G X. Associations of *Helicobacter pylori* infection and cytotoxin-associated gene A status with autoimmune thyroid diseases: a meta-analysis. Thyroid. 2013;23:1294–1300
21. Vincenzo Bassi, Gennaro Marino, Alba Iengo, Olimpia Fattoruso, and Crescenzo Santinelli, Autoimmune thyroid diseases and Helicobacter pylori: The correlation is present only in Graves's disease;World J Gastroenterol. 2012; 14; 18(10): 1093–1097.;Published online 2012 Mar 14. doi: 10.3748/wjg.v18.i10.1093.