Original Article

Prevalence of Cobalamin (Vitamin B12) Deficiency Associated with Autoimmune Gastritis in Patients Suffering from Autoimmune Disorders

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Abstract

Background: Autoimmune gastritis (AG) is a chronic gastritis characterized by inflammation of the stomach lining and is often associated with intrinsic factor deficiency and pernicious anemia. **Objectives:** This study aimed to investigate AG as a diagnostic entity and its association with cobalamin (vitamin B12) deficiency, particularly its gender-specific prevalence. Additionally, the study examined gastrin levels and antinuclear antibody positivity in patients diagnosed with AG. **Materials and Methods:** The study included 500 patients (240 male and 260 female) diagnosed with AG. Specimens, including blood samples and gastric biopsies, were collected from the Hilla Teaching Hospital between March and September 2023. **Results:** AG was characterized by immune-mediated damage to the stomach lining, leading to inflammation. Inflammation can impair the production of intrinsic factors that are vital for vitamin B12 absorption, thereby increasing the risk of cobalamin (vitamin B12) deficiency. This study found a higher prevalence of cobalamin (vitamin B12) deficiency in females compared to males among patients with AG. Additionally, gastrin levels were assessed in the study population. **Conclusion:** This study underscores the importance of understanding gastric histology for the accurate diagnosis of AG. Insights into the microscopic structure and function of the stomach lining will contribute to a comprehensive understanding of gastric physiology. These findings highlight the sex-specific prevalence of cobalamin (vitamin B12) deficiency in patients with AG, with females being at higher risk. Furthermore, the presence of antinuclear antibodies indicated an association between AG and other autoimmune diseases.

Keywords: Antinuclear antibodies (ANA), autoimmune gastritis (AG), cobalamin (vitamin B12), enterochromaffin-like (ECL), gastrin

Introduction

Autoimmune gastritis (AG) is a persistent inflammatory condition that targets the stomach lining and results from the immune system mistakenly attacking healthy cells. Parietal cells, responsible for producing stomach acid and an intrinsic factor vital for cobalamin (vitamin B12), regulate the nervous system.[1] They also play a role in the growth and red blood cell formation of red blood cells (RBCs), to be the focal point of this immune assault. The ensuing autoimmune response triggers inflammation, leading to atrophy of the stomach lining and compromised acid secretions. The characteristic symptoms of AG include abdominal pain, bloating, and nausea.[2] Additionally, the continuing wildlife of the illness demands an inclusive empath for its appearances and possible long-term consequences. Left unprocessed, AG can develop into Spartan's complications. A multidimensional treatment tactic may comprise pills to overwhelm the immune retort, succeed in symptoms, and discourse nourishing is lacking. Regular specialist care is necessary to make the headway of the disorder and adjust treatment approaches accordingly. Additionally,

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practical events to avert complications, such as pernicious anemia and malabsorption, are essential components of the overall organization plan. Patients often experience worries related to cobalamin (vitamin B12) deficiency, such as anemia and neurological issues. AG poses important health risks, and its probable problems emphasize the importance of timely intervention. Pernicious anemia due to reduced B12 preoccupation is a noteworthy concern. Malabsorption topics further underwrite nutritional deficiencies, aggravating the overall health impact.[3]

Moreover, patients with AG have an increased risk of emergent gastric cancer, highlighting the need for timely intervention. Early uncovering is critical in the management of AG and patients' quality of life.[4] However, they also pose some risk, since a bargained immune system may be less talented about standing off infections. Usually, treatment schedules are tailored based on the symptoms and necessities of the patient as well as on the particular autoimmune disease. For people with autoimmune ailments to successfully manage their condition and lessen the possibility of medication side effects, close collaboration is needed. A practical and inclusive treatment approach, combined with regular specialist care and follow-up, is vital for the successful management of this illness and for extending the risks linked to patients' well-being. People with autoimmune disorders are frequently prescribed immunosuppressive drugs. These drugs function by overpowering the immune system to decrease undesired immune responses.[5,6]

The inflammatory pathology of the stomach was categorized according to various criteria.[7] Temporal classifiers, which distinguish between acute (self-limited) and chronic (non-self-limited) forms of gastritis, are widely used. Keep in mind that this classification is only clinical, and terms like "acute" and "chronic" have no place in the histological report. In fact, the term "acute" when referring to neutrophilic inflammation is misleading, because nearly all gastritis that requires histological examination is in chronic forms.[8] Given the possible involvement of multiple causes in the evolution to atrophy, it is preferable to employ etiology-based classification at the histological level. This is essential for healthcare professionals.[9]

Endoscopy allows direct visualization of the stomach lining, aiding in the evaluation of inflammation, atrophy, and other potential issues. Additional diagnostic measures, such as computed tomography (CT) scans, may be utilized to identify structural abnormalities within the gastrointestinal tract.

Materials and Methods

Study design

This study included 500 patients (240 male and 260 female) with AG who were diagnosed with autoimmune disorders. After obtaining samples from patients, vitamin B12 levels were recorded by measuring vitamin B12 levels in blood samples. Data collection was conducted from March to September 2023 at Hilla Teaching Hospital. Vitamin B12 and gastrin levels were measured using ELISA kits. Measurement of vitamin B12 may help confirm the autoimmune nature of the condition. Serum gastrin levels were also measured, as high levels of gastrin in the blood can serve as a crucial indicator of AG.

Endoscopy

This procedure allows direct visualization of the stomach lining, aiding in the evaluation of inflammation, atrophy, and other potential issues. Additional diagnostic measures, such as CT scans, may be utilized to identify structural abnormalities within the gastrointestinal tract. These imaging techniques help in detecting any anatomical irregularities that could contribute to the pathology,[9] and testing for vitamin B12 levels is essential, as AG can lead to impaired absorption of this crucial vitamin, potentially resulting in deficiencies. Monitoring vitamin B12 levels provides clinicians with important information about the patient's nutritional status and aids in developing an appropriate treatment plan to address deficiencies and effectively manage AG.[10]

Gastric histology

The gastric mucosa is separated into two primary zones, muco-secreting and oxyntic regions, which vary in both histological and functional aspects. The large, round, highly acidophilic cells (i) known as (oxyntic) cells are found in the specialized glands that make up the oxyntic mucosa, (ii) enterochromaffin-like cells, and (iii) basophilic cells. The glands that produce gastrin and have abundant mucous cells define the mucosa.

The report of histology

Gastritis is diagnosed both histologically and clinically; a pathologist should always be provided with clinical information to help interpret the results of endoscopy and histology. The system protocol required stomach biopsy sampling. More specimens from the lesions were added. The specimens and corpus/fundus biopsies were placed in separate containers, and the biopsy material was handled carefully. In routine practice, H&E and modified Giemsa were used as staining agents for gastritis. Important details, such as the patient's clinical history, endoscopic features, and the biopsy sampling map, were included in the pathology request form.

Ethical approval

Approval was obtained from the ethics committee. This study was approved by the Local Ethics Committee of the College of Medicine, University of Babylon, and the

Hospital Ethics Committee under document number [IRB: 3-29, 1/03/2023].

Results

In this study, 500 individuals (240 male and 260 female) with AG were included. The results in Table 1 show the gastrin levels in the blood of patients compared with the control group. Table 2 shows the vitamin B12 levels in the blood of patients compared with the control group. All antinuclear antibodies tests were positive for antinuclear antibodies.

In Tables 1 and 2, the control values provide information about the significance of the *P* value for both gastrin and vitamin B12 levels across different age groups in autoimmune diseases. Analysis of the results showed that there were variations in the levels of gastrin and vitamin B12 across different age groups, and these differences were statistically significant in some age groups but not in others. In the group aged less than 12 months, both gastrin and vitamin B12 levels showed significant differences compared to the other age groups. This indicates that infants with autoimmune diseases may have altered levels of these biomarkers, potentially indicating an underlying gastrointestinal issue. However, in the age groups of 1–5 years and 6–11 years, there were significant differences in both gastrin and vitamin B12 levels.

This indicates that these age groups also exhibited alterations in these biomarkers, which may be associated with autoimmune-related gastrointestinal problems. In the age groups 12–17 years, there was no significant difference observed in either gastrin or vitamin B12 levels compared to the other groups. This indicates that these biomarkers may stabilize or undergo changes unrelated to autoimmune diseases during adolescence. In the 18–24 years age group, a significant difference was observed in both gastrin and vitamin B12 levels. This may indicate that young adults with autoimmune diseases continue to experience gastrointestinal issues that affect these biomarkers. A comparison of the results with the control *P* value indicated that the significant differences observed in gastrin and vitamin B12 levels were consistent across different age groups, indicating the reliability of these findings. The importance of considering age when assessing biomarkers in autoimmune diseases, particularly those related to gastrointestinal functions, such as gastrin and vitamin B12. Further research is required to understand the underlying mechanisms and clinical implications of these alterations in different age groups.

In Table 3, a *P* value less than 0.05 indicates statistical significance. Gastritis or inflammation of the stomach lining is often caused by infection, stress, or medication. In the affected tissue, the stomach lining appeared red and swollen, and erosion or ulceration may be evident. The symptoms include nausea, vomiting, and abdominal pain. Part of the treatment includes taking medication to reduce stomach acid levels and addressing the underlying cause. Figure 1 showed that gastritis tissue biopsies play a pivotal role in the diagnostic process, which involves the collection of tissue samples for histopathological examination. Analysis of biopsy samples can reveal characteristic features such as chronic inflammation and destruction of parietal cells, providing valuable insights into the nature and severity of AG. Additionally, endoscopy and biopsy were performed.

Table 1: Gastrin levels (medium, standard deviation with control value) in this study

Age	Gender	Gastrin (pg/mL) Patients (mean ± SD)	Gastrin (pg/mL) Control (mean ± SD)
1–12 months	Male	100.32 ± 11.41	110.3 ± 30
	Female	106.41 ± 13.21	120.6 ± 34
1–5 years	Male	485.45 ± 13.6	140.6 ± 40
	Female	489.61 ± 12.33	150.1 ± 45
6–11 years	Male	310.33 ± 15.1	170.3 ± 50
	Female	318.97 ± 16.0	180.7 ± 53
12–17 years	Male	311.51 ± 14.9	200 ± 60
	Female	316.41 ± 13.21	210 ± 65
18–24 years	Male	314.66 ± 11.5	225 ± 40
	female	315.38 ± 14.13	137 ± 35

Table 2: Cobalamin (vitamin B12) level (pg/mL) (medium, standard deviation with control value) of subjects aged 1 month to 24 years

Age	Gender	Vitamin B12 patients (mean ± SD)	Vitamin B12 control (mean ± SD)
1–12 months	Male	210 ± 17	220 ± 40
	Female	243 ± 21	230 ± 42
1–5 years	Male	264 ± 112	250 ± 50
	Female	248 ± 100	260 ± 56
6–11 years	Male	235 ± 124	270 ± 61
	female	264 ± 105	280 ± 65
12–17 years	Male	200 ± 122	300 ± 73
	Female	215 ± 106	310 ± 76
18–24 years	Male	232 ± 145	320 ± 82
	Female	217 ± 104	330 ± 87

Table 3: Table presenting the results on gastrin and cobalamin (vitamin B12) levels according to age in autoimmune diseases, along with $P \leq 0.05$ is significance

Age (group)	*P* value (gastrin)	*P* value (vitamin B12)
<12 months	0.001**	0.02*
1–5 years	0.005**	0.03*
6–11 years	0.02*	0.005**
12–17 years	0.07	0.07
18–24 years	0.03*	0.05*

*Significant

**Highly significant

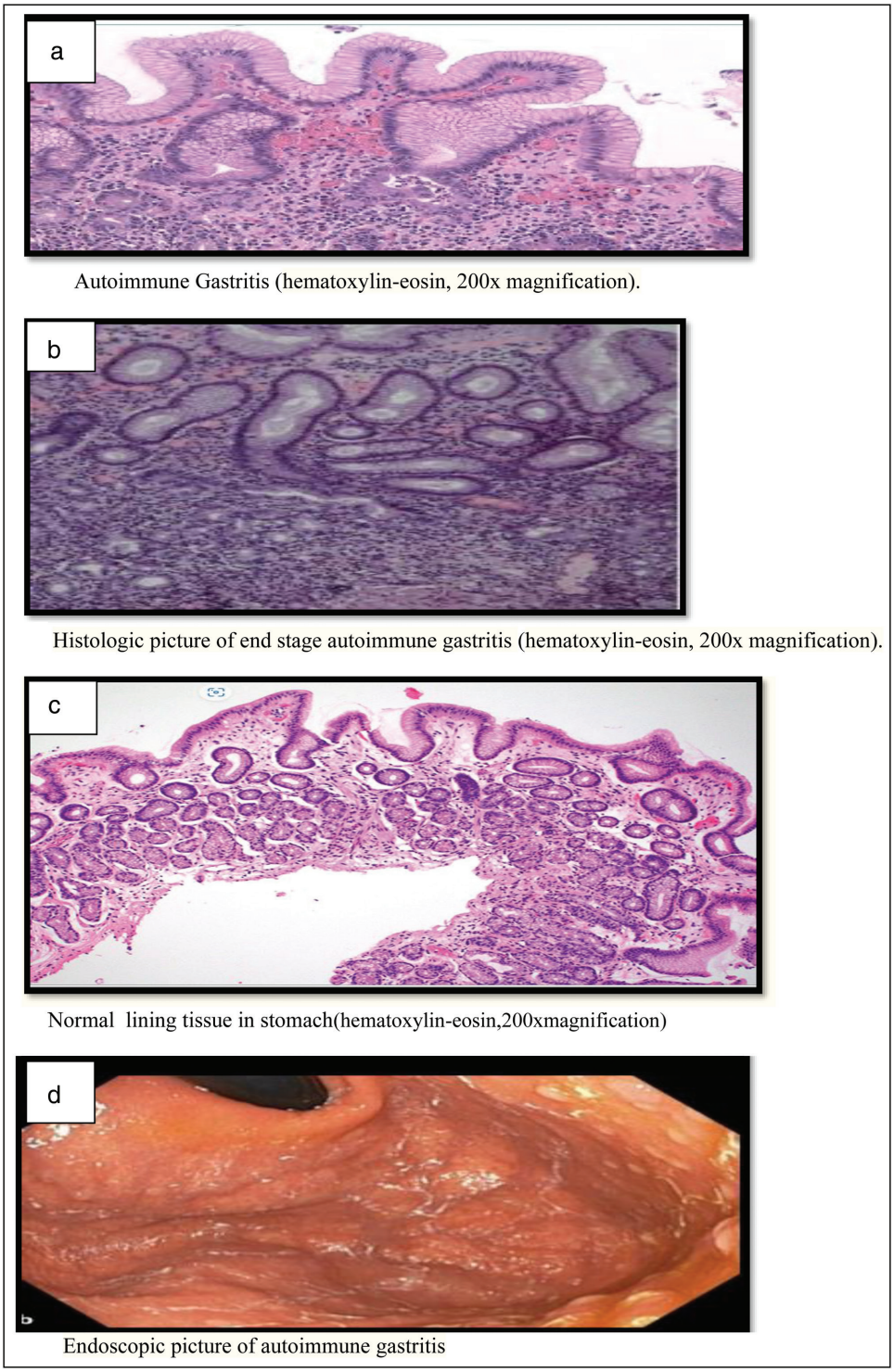

Figure 1: Histological features of autoimmune gastritis (AG) (a–d). (a) AG (hematoxylin–eosin, 200× magnification). (b) Histologic picture of end-stage AG (hematoxylin–eosin, 200× magnification). (c) Normal lining tissue in the stomach (hematoxylin–eosin, 200× magnification). (d) Endoscopic picture of AG

Discussion

Vitamin B12 plays a critical role in cellular and humoral immunity by mediating its action through one-carbon metabolism. "Secondary folate deficiency" due to folate trap resulting from vitamin B12 deficiency results in decreased synthesis of thymidine and purines, thus affecting the production of deoxyribonucleic acid (DNA) and ribonucleic acid (RNA), which are important for cell division, formation of RBCs, and hence immunity. Secondary folate deficiency resulting in a methyl folate trap affecting DNA and RNA synthesis leads to alterations in

immunoglobulin secretion, leading to decreased humoral immunity.

This study demonstrated a comprehensive and accurate relationship between AG and cobalamin (vitamin B12) deficiency. This summary covers the key aspects, including the role of intrinsic factors, the consequences of impaired vitamin B12 absorption, the symptoms of deficiency, the prevalence of deficiency in AG patients, screening and treatment strategies, and the importance of long-term management. This information emphasizes the significance of monitoring and managing AG and potential vitamin B12 deficiencies to improve the overall well-being of affected individuals. It is essential for patients with AG to maintain a collaborative relationship with healthcare providers for effective screening, diagnosis, and ongoing management.

Tissue abnormalities in the cell lining of gastritis were consistent with the findings shown in Figure 1. This correlation aligns with the results reported by several authors[11,12] who demonstrated similar outcomes. Analysis of vitamin B12 levels revealed a deficiency that was more pronounced in females than in males, indicating a noteworthy association with AG [Table 2]. This finding was compatible with the investigations conducted by several authors.[13,14] Additionally, the study by AHussein *et al*.[15] also affirmed a comparable relationship with AG. Gastrin levels in this study were higher in females compared to males, a pattern that corresponds with the findings reported by Zhang *et al*.[16] Similar results were observed in other studies,[17] reinforcing the consistency of this observation. Moreover, the study by Vaqar and Shackelford[18] further supports the outcomes of the present research. This study sheds light on the frequent association between AG and other autoimmune disorders.[19,20] This interconnectedness of autoimmune conditions within the same individual was noted approximately 30 years ago by Rodriguez-Castro *et al*.,[21] who described the endoscopic and microscopic features of the condition as lymphocytic gastritis, characterized by the accumulation of lymphocytes in the gastric epithelium.[22,23] Notably, the presence of autoimmune disorders can complicate the overall health of individuals with AG, as indicated in previous research. Understanding these associations is crucial for a comprehensive approach to managing the health of individuals with AG.

Conclusion

Based on the data presented, there is a significant association between cobalamin (vitamin B12) deficiency and AG in patients with autoimmune disorders. The prevalence of vitamin B12 deficiency is notably higher in patients with autoimmune disorders, suggesting a potential link between AG and vitamin B12 deficiency in these individuals. This indicates that patients with these autoimmune disorders may be at an increased risk for vitamin B12 deficiency when associated with AG. However, at 12–17 years, the association was not significant. These findings emphasize the importance of screening for vitamin B12 deficiency, especially in patients with autoimmune disorders, as it may have implications for their overall health and management of their autoimmune conditions. Further studies are warranted to explore the underlying mechanisms and potential interventions to mitigate vitamin B12 deficiency in this population.

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Conflicts of interest

There are no conflicts of interest.

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