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Study of Mineral Levels of Infected People with H. pylori

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ABSTRACT

Objective: *Results from earlier research on the relationship between Helicobacter pylori (H. pylori), as well as osteoporosis. A few studies have examined H's effects. The current study aims to detect the effects of H. pylori on patients' mineral levels, particularly copper. Blood levels of copper, zinc, calcium, and magnesium are affected by pylori infection.* ***Methods:*** *The blood samples were collected using sterile containers. A H. pylori diagnosis was performed using a stool culture, and blood magnesium and calcium levels were measured using a Fujifilm device (Japan) while Zinc and copper were measured using commercially accessible colorimetric analyze kit (ABC Diagnostic Egypt).* ***Results:*** *This study showed significant decreased (P< 0.05) in blood levels of magnesium, calcium and copper in H. pylori positive patients (1.85 ± 0.44 mg/dl, 2.07 ± 0.16 mg/dl and 144.9±28.92 µg/dl respectively) compared with control (2.94 ± 0.32mg/dl, 3.88 ± 0.31mg/dl, 170.23±25.95µg/dl respectively) in contrast to zinc concentration that considerably augmented in H. pylori positive sick (372.5±111.2µg/dl) compared with control (368.9±120.1 µg/dl). Furthermore, H. pylori contagion related with reduction in blood ranks of magnesium, calcium, zinc and copper compared with patients with peptic ulcer caused by other etiologies but not significantly (P > 0.05).* ***Novelty:*** *We institute H. pylori contagion might be related with an augmented hazard of emerging osteoporosis throughout their role in malabsorption of essential minerals in patients food.*

INTRODUCTION

In 1982, Warren and Marshall made the initial identification of H. pylori, harmful bacteria with a spiral shape that are present on the human stomach mucosa. It is among the most common diseases that affect people worldwide [1]. Duodenal ulcers, gastric ulcers, gastric adenocarcinomas, lymphoid tissue lymphoma associated with the gastric mucosa, and chronic gastritis are all greatly impacted through H. Pylori. [2,3]. H. pylori contagion affects the digestion and absorption of dietary nutrients via altering stomach secretion and acidification activities. This illness can lead to insufficiencies in micronutrients, such as minerals and trace components, which can impair immunological and biological functions [4,5]. Because they regulate molecular structures and serve as co-factors for the cell's enzymes, micronutrients stay vital to life. Infection-related morbidity and humanity are predisposed through micronutrient insufficiencies, which influence immunological homeostasis [6]. A healthy stomach is necessary for the absorption of numerous vitamins. The stomach releases hydrochloric acid and enzymes, which stay necessary throughout the digestive method to liberate micro-nutrients as of the food milieu and, in the case of important minerals, to extract them soluble, even though it is not involved in the absorption process [7]. stomach physiology may be altered by the prolonged inflammatory reaction of the stomach

mucosa to an H. pylori contagion [8]. Consequently, H. pylori can chief to a range of clinical symptoms, disrupt the immersion of different nutrients, and impair the nutritious station of diseased sick [9]. In addition to being a necessary trace element present in bodily fluids and tissues, zinc (Zn) is involved in numerous metabolic processes, including immunological processes, growth, development, and protein production. [10,11]. Trace elements are vital for life, and their abundance or deficiency can lead to worsening in the humanoid body [11]. Micronutrient deficiencies, such as those of iron (Fe), Calcium (Ca), and copper (Cu), can have detrimental properties owing to medical concerns, including reduced fighting to contagions, anemia, and negative properties on pregnancy and growing [12]. Cu is a crucial part of human physiology and several enzymes. Leukopenia, epiphyseal fibrosis, osteoporosis, microcytic anemia, and the development of new sub-periosteal bone are all possible outcomes of a Cu deficit [13]. It is widely acknowledged that one of the greatest crucial processes in the detoxification of superoxide radicals stays the action of intracellular superoxide dismutase (Zn/Cu-SOD) [14]. Se is a vital vitamin that has antioxidant and anticancer properties. Malignancies, oxidative stress diseases, immunological response problems, and infection susceptibility are only a few of the consequences that might result from a se deficit [15]. According to some research, baseline serum Se concentrations and the chance of dying from gastric cardia cancer are inversely correlated [16]. Fe deficiency has been linked to increased DNA damage and gastrointrace elements tinal carcinogenesis risk. Serum levels of several elements, including magnesium, calcium, and zinc [17] did not significantly differ between individuals with and deprived of H. pylori contagion, according to a few investigations [16]. To the best of our knowledge, this is the first study to report the levels of 4 elements in tissue and serum samples, along with the correlation between Trace elements and the existence or lack of H. pylori contagion. These factors make it crucial to measure the levels of Trace elements in biological samples from sick with H. pylori gastritis so as to track and observe how Trace elements affect human health.

RESEARCH METHOD

The existing training is a case – control study directed from February, 2024 to May, 2025. It involved collecting blood and stool samples from patients who referred to the Laboratory Department and the Digestive System Center at Diwaniyah General Teaching Hospital, who were suffering from indigestion and stomach pain. Legal and moral agreement was gotten as of the hospital administration and from the patients before taking samples and conducting clinical or laboratory tests. After clinical examination of patients by specialist, blood samples were collected from the same patients using a tube gel. A Helicobacter pylori diagnosis was performed using a stool culture on Columbia agar (Bioneer/Kura), and blood magnesium and calcium levels were measured using a Fujifilm device (Japan). Zinc and copper were measured using commercially obtainable colorimetric analyze kit (ABC Diagnostic Egypt). The same samples were also collected from 50 healthy individuals as a control group to compare

the results. Microsoft Excel 2010 and the (SPSS) version 22 stayed run down for statistical analysis.

Significant differences were calculated using the number and percentage of patients, and a difference with statistical importance stayed distinct as a probability rate of less than 0.05 [17].

RESULTS AND DISCUSSION

Results

According to bacteriological examination of the taken samples, 67%, of the researched cases (47/ 70 sick) attested to be *H. pylori*-infection and 33% (23/70 sick) stood negatively as shown in figure (1). The mean age stayed considerably upper in *H. pylori*-positive grouping (51.2 years) than in *H. pylori*-negatively grouping (42.7years) and control (43.5 years) with P = 0.093 (table. 1). When evaluating the rate of *H. pylori* contagion rendering to the patient's gender in Figure 2, we found that bacterial infection was more common among females (57%) compared to males (43%) among patients, while the rate of males was higher among the control and those not infected with the bacteria (52 and 51% respectively).

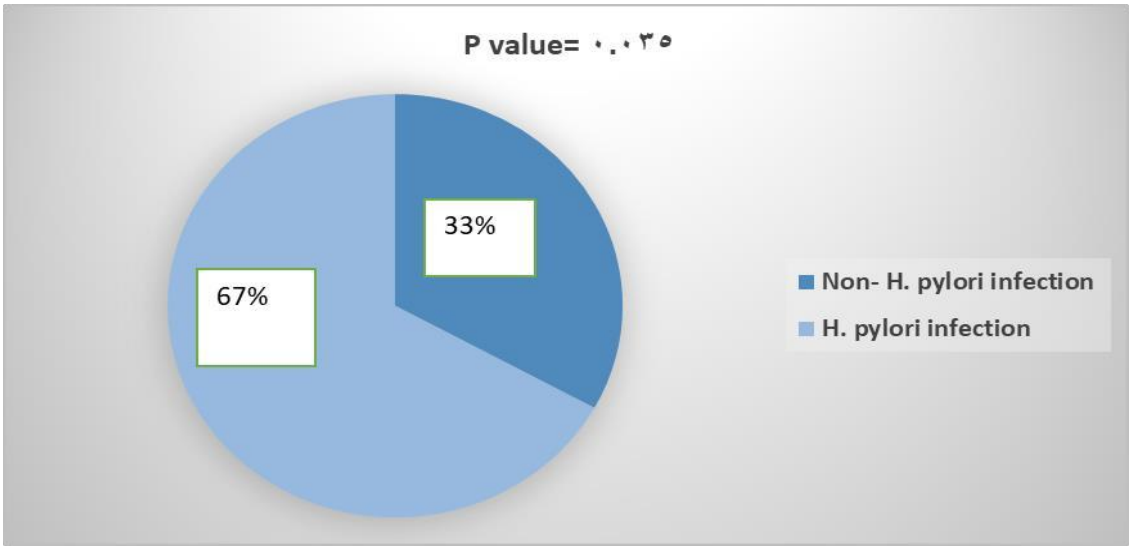

Figure 1. Distribution of *H. pylori* contagion among sick with gastritis

Table 1. Compared age properties of cases with control group

Appearance	Positive H. pylori	Negative H. pylori	Control
Range of Age /year	19 -73	17 – 77	17 – 75
Age mean	51.2	42.7*	43.5
Standard deviation	± 11.55	± 9.72	± 6.86
Standard error	1.67	1.79	0.97
Total number	47	23	50

*significant difference (P value < 0.05) in paralleled with *H. pylori* positively group

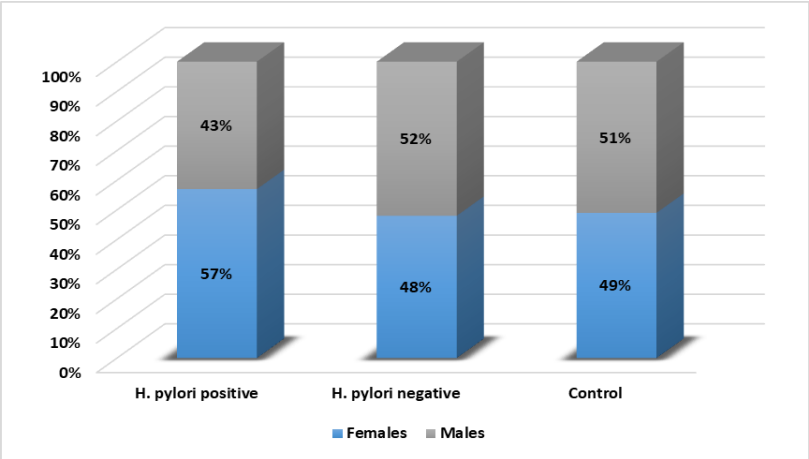

Figure 2. Frequency of participants' gender among studied groups

To determine effect *H. pylori* infection on mineral concentration we designed table 2 that showed significant decreased (P< 0.05) in blood levels of magnesium, calcium and copper in H. pylori positive patients (1.85 ± 0.44 mg/dl, 2.07 ± 0.16 mg/dl and 144.9±28.92 µg/dl respectively) compared with control (2.94 ± 0.32mg/dl, 3.88 ± 0.31mg/dl, 170.23±25.95µg/dl respectively) in contrast to zinc concentration that significantly increased in *H. pylori* positive patients (372.5±111.2µg/dl) compared with control (368.9±120.1 µg/dl) but not significantly (P = 0.156). In table 3 evaluation mineral concentration of patients with gastric ulcer and detection if the *H. pylori* the cause or non of minerals deficiency. However, we found *H. pylori* infection causes decrease mineral concentration i.e patients with peptic ulcer caused by *H. pylori* contagion related with reduction in blood ranks of magnesium, calcium, zinc and copper compared with patients with peptic ulcer caused by other etiologies but not significantly (P > 0.05). When compared mean of minerals concentration according to gender of patients who infection by *H. pylori* in table 4, we found mean of magnesium, zinc and copper significantly increased (P value < 0.05) in males (1.70 ± 0.32mg/dl, 399.5±109.2 µg/dl, 158.9±28.98 µg/dl respectively) compared with females (1.11 ± 0.47 mg/dl, 301.5±114.5 µg/dl, 132.9±28.71 µg/dl respectively) in contrast mean of calcium significantly decreased (P value= 0.045) in males (1.79 ± 0.11 mg/dl) compared with females (2.12 ± 0.16 mg/dl).

Table 2. Comparison mean ± standard deviation of minerals' concentration among *H. pylori* positively cases and control

Concentration of minerals	Positive H. pylori	Control	p-value	Concentration of minerals	Positive H. pylori	Control
Magnesium (mg/dl)	1.85 ± 0.44	2.94 ± 0.32	0.033	Magnesium (mg/dl)	1.85 ± 0.44	2.94 ± 0.32
Calcium (mg/dl)	2.07 ± 0.16	3.88 ± 0.31	0.027	Calcium (mg/dl)	2.07 ± 0.16	3.88 ± 0.31
Zinc (µg/dl)	372.5±111.2	368.9±120.1	0.156	Zinc (µg/dl)	372.5±111.2	368.9±120.1

Copper (µg/dl)	144.9±28.92	170.23±25.95	0.019	Copper (µg/dl)	144.9±28.92	170.23±25.95

Table 3. Comparison mean± standard deviation of the minerals' concentration among *H. pylori* positively and negatively cases

Concentration of minerals	Positive H.pylori	Negatve H.pylori	p- value
Magnesium (mg/dl)	1.85 ± 0.44	2.01 ± 0.46	0.074
Calcium (mg/dl)	2.07 ± 0.16	2.91 ± 0.66	0.048
Zinc (µg/dl)	372.5±111.2	381.2±123.3	0.051
Copper (µg/dl)	144.9±28.92	153.4±19.6	0.057

Table 4. Compared of *H. pylori* contagion among men and women

Concentration of minerals	Male	Female	p- value
Magnesium (mg/dl)	1.70 ± 0.32	1.11 ± 0.47	0.047
Calcium (mg/dl)	1.79 ± 0.11	2.12 ± 0.16	0.045
Zinc (µg/dl)	399.5±109.2	301.5±114.5	0.031
Copper (µg/dl)	158.9±28.98	132.9±28.71	0.037

Discussion

The outcomes of our research displayed that the occurrence of *H. pylori* contagion increases among the elderly, especially females. This is consistent with some previous studies that attributed this to the influence of female hormones [19, 20]. Moreover, study of Ibrahim *et al* showed the cause might be that the alteration in hormone excretion between males and females disturbs gastric evacuating and bacterial load, which involves additional research. Further social events for males rise the fortuitous of *H. pylori* contagion. The living habits and eating habits of men and women are different, which can also increase the chance of *H. pylori* infection [21]. In contrast, other studies found increased *H. pylori* infection in makes [22,23] this may be related to further recurrent antimicrobial management in females with urogenital tract contagions could instantaneously remove *H. pylori* contagion [22,23]. Age, gender, socioeconomic prominence, and other features are related with *H. pylori* contagion, as demonstrated in our training. The contagion proportion in China is around 50% [7]. As the populace ages, the illness individualities of the elderly populace are appreciated more via the entire culture [18,23]. Additionally, the majority of studies have confirmed that the weakened immune system with age makes people more susceptible to *H. pylori* infection [24]. Zhang *et al*. confirmed that Type I *H. pylori* seroprevalence stays upper in elderly individuals, and the dissemination of *H. pylori* straining is considerably influenced through age, region, and nutritional practices [24,25]. In present study,

H. pylori infection causes decrease mineral concentration i.e patients with peptic ulcer caused by *H. pylori* contagion related with reduction in blood ranks of magnesium, calcium, zinc and copper compared with patients with peptic ulcer caused by other etiologies but not significantly except calcium ($P > 0.05$) this may be due to that

H. pylori contagion is related with numerous gastrointrace elements tinal disorders prevent mineral and vitamins absorption, and medications used in gastrointrace elements tinal sicknesses might be additional reason of mineral deficiency. Malabsorption of minerals, especially nutritional calcium, is a source of osteoporosis, and gastric acid stays essential for calcium absorption [26,27]. The usage of proton pump inhibitors (PPIs) and histamine 2 receptor blockers (H2RBs) in *H. pylori* abolition treatment can inhibit gastric acid excretion, which reduces the absorption of calcium, potassium, and zinc salts, foremost to osteoporosis. A meta-analysis via Ngamrongvong et al. showed that PPI use augmented the danger of hip and vertebral fractures [28,29]. In the pervious training, researchers institute an upper occurrence of osteoporosis in the *H. pylori* abolition grouping. This mechanistic study may be related to gastrointrace elements tinal mineral malabsorption resulting as of *H. pylori* abolition treatment. Nevertheless, further approaches are still needed to elucidate the pivotal association and comprehensive apparatus [30]. The greater occurrence of anemia seen during obliteration treatment could be owing to a long-lasting *H. pylori* contagion. First, calcium absorption may be changed by a persistent *H. pylori* infection. Pangastritis or gastric ulceration can result from *H. pylori*'s ability either to reduce or enhance the production of gastric acid, which influences one to duodenal ulceration [31]. The hypo-chlorhydric stomach weakens calcium homeostasis and changes bone mass [32, 33]. The long-lasting gastritis as of *H. pylori* consequences in atrophic gastritis, which rises the probability of osteoporosis [34]. Second, according to a recent Taiwanese population-based cohort study, chronic H. pylori infection raised the chance of developing end-stage renal disease (ESRD) later on. [35]. Patients with ESRD and chronic kidney disease frequently have inadequate levels of vitamin D, which is essential for the intestinal absorption of minerals. [36, 37]. Moreover, Ayesh et al. discovered that those with H. Vitamin B12 levels were lower in those with H. pylori infection. [38]. Furthermore, low bone mineral density may be linked to low vitamin B12 plasma levels. [39]. On the other hand, the outcomes of the current research displayed a lower concentration of the studied salts, except for calcium, in females compared to males diseased with *H. pylori*. The reason for this is not certain, and studies have not addressed this topic. In any case, the reason for this may be due to physiological factors such as menstruation and pregnancy, or perhaps due to the more severe infection in females, which is sometimes accompanied by bleeding [40]. Sex hormones can influence mineral metabolism, and hormonal differences between males and females might play a role in how *H. pylori* affects salt concentrations [3,40]. Furthermore, we need further studies in this regard.

CONCLUSION

Fundamental Finding : This study showed significant decreased ($P< 0.05$) in blood levels of magnesium, calcium and copper in H. pylori positive patients (1.85 ± 0.44 mg/dl, 2.07 ± 0.16 mg/dl and 144.9±28.92 µg/dl respectively) compared with control (2.94 ± 0.32mg/dl, 3.88 ± 0.31mg/dl, 170.23±25.95µg/dl respectively) in contrast to zinc concentration that significantly increased in H. pylori positive patients

(372.5±111.2µg/dl) compared with control (368.9±120.1 µg/dl) but not significantly (P = 0.156). Furthermore, H. pylori infection causes decrease mineral concentration i.e patients with peptic ulcer caused by H. pylori contagion related with reduction in blood ranks of magnesium, calcium, zinc and copper compared with patients with peptic ulcer caused by other etiologies but not significantly (P > 0.05). When compared mean of minerals concentration according to gender of patients who infection by H. pylori, we found mean of magnesium, zinc and copper significantly increased (P value < 0.05) in males (1.70 ± 0.32mg/dl, 399.5±109.2 µg/dl, 158.9±28.98 µg/dl respectively) compared with females (1.11 ± 0.47 mg/dl, 301.5±114.5 µg/dl, 132.9±28.71 µg/dl respectively) in contrast mean of calcium significantly decreased (P value= 0.045) in males (1.79 ± 0.11 mg/dl) compared with females (2.12 ± 0.16 mg/dl). **Implication :** Therefore, we must take into consideration the mineral deficiency in ulcer patients when administering treatment, as the treatment must include nutritional supplements that fill the deficiency in these minerals, especially in female patients. **Limitation :** The reason for the lower concentration of the studied salts, except for calcium, in females compared to males diseased with H. pylori is not certain, and studies have not addressed this topic. **Future Research :** Further studies in this regard are needed to elucidate the pivotal association and comprehensive apparatus between H. pylori infection, mineral malabsorption, and differences in mineral concentrations according to gender.

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