

EVALUATION OF SOME HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS IN PATIENTS INFECTED WITH HELICOBACTER PYLORI ATTENDING IMO STATE SPECIALIST HOSPITAL, OWERRI

Aloy-Amadi Oluchi C.^{1*}, Ogboso Sophy C.¹, Eberendu I.F.², Ukonu Uche C.¹, Emeka-Obi Obioma R.³, Nwabueze Jennifer U.¹

¹Department of Medical Laboratory Science, Imo state University, Owerri, Nigeria.

²Department of Public Health, Imo State University Owerri, Nigeria.

³Department of Haematology, College of Medicine, Federal University of Technology, Owerri, Nigeria.

Corresponding Author: Aloy - Amadi Oluchi Chinwe, Email: oluchialoy@yahoo.com

Abstract: Helicobacter pylori is a bacterium that causes peptic ulcer disease. This study was aimed at determining the levels of some haematological parameters and biochemical parameters of patients infected with Helicobacter pylori attending Imo State Specialist, Hospital Umuguma, Owerri. A cross-sectional study was carried out from the month of June to August, 2023 and all eligible subjects who filled the questionnaire and gave a written informed consent for the study were sampled. The study population consisted of 50 H. pylori infected patients and an equivalent number of aged - matched healthy subjects, who served as the controls. Blood samples were collected from the participants and analysed for PCV using micro haematocrit method, Red blood cell counts using Thoma (manual counting) method, serum iron (Ferrozine method) and amylase using enzymatic method. The results of the tests were analyzed using SPSS version 21. The mean values of PCV (31.36±3.53)%, RBC (3.93±4.69)×10¹²/L and serum iron (48.22±19.66)µg/dl were significantly reduced in H. pylori infected individual when compared to controls (36.10±3.37)%, (5.25±7.13)×10¹²/L and (79.16±19.32), µg/dl (p=0.000). The mean value of amylase (95.15±34.88) U/L was significantly increased in H. pylori infected individuals when compared to controls (52.92±11.44) U/L. There was no significant difference in the mean values of PCV (32.29±3.49)%, RBC (3.76±3.71) ×10⁹/L, Iron (45.18±17.59) µg/dl and Amylase (99.28±37.86)U/L in male H. pylori infected individuals when compared to the females. (30.50±3.40)%, (4.08±5.51) ×10⁹/L, (51.04±21.35) µg/dl and (91.35±32.15) U/L t=1.83, (p=0.073, t=1.06, p=0.297, t=0.80, p=0.427, t= 0.23, and p=0.818. H.pylori infection leads to a decline in packed cell volume, RBC and serum iron levels and an increase in amylase. Gender difference does not have an effect on PCV, RBC, iron and amylase levels in H. Pylori infection.

Keywords: Peptic ulcer; Helicobacter pylori; Packed cell volume; Red blood cell; Amylase; Serum Iron

1 INTRODUCTION

Helicobacter pylori is a spiral, flagellated, Gram-negative bacteria, specially adapted to survive in the gastric lumen and considered the most successful human pathogen infecting about 50% of the global population [1]. Haematological parameters include the level of circulating blood cell. It gives a measure of the variability in the size, shape and count of circulating blood cells [2]. Recent studies have suggested an association between H. pylori infection and iron-deficiency anemia in adults [3]. It is well known that peptic ulcers and gastric carcinomas are likely to bleed either as overt or occult bleeding, which may eventually lead to iron deficiency anaemia.

Amylases are starch degrading enzymes. Few studies have been carried out to study the direct effect of serum amylase on the mortality but a lot of study analyze the factors that may tends to increase the level of serum amylase such as the size of perforation ,time delay before surgery and amount of fluid spilled in the peritoneal cavity. A study carried out by Underkofler et al. (2015) revealed a strong correlation between the factors and serum amylase level so that the rise in serum amylase level is directly proportional the size of perforation [4], time interval before surgery and amount of peritoneal contamination

H. pylori contain an iron-binding protein resembling ferritin that has a binding activity for heme iron in red blood cells. Moreover, H. pylori carries an iron repressible protein in its outer membrane [3]. H. pylori contain an iron-binding protein resembling ferritin that has a binding activity for heme iron in red blood cells. Moreover, H. pylori carries an iron repressible protein in its outer membrane [3]. Interestingly, two prospective studies have shown that people with low serum ferritin levels are more likely than other people to develop gastric cancer later in life.

Cullen et al., (2017), reported in his studies that there was no evidence of serious blood loss, that bleeding occurs when ulcer erodes one of the blood vessels [5], such as the gastroduodenal artery. There is still dearth in knowledge on haematological and some biochemical parameters in H. pylori infected patients. This research is aimed at determining the levels of haematological parameters, iron and amylase level in patient with H. pylori infection at the Imo State Specialist

Hospital, Umuguma. The study will be of immense importance in the area of diagnosis and management of *H. pylori* infection.

2 MATERIALS AND METHODS

2.1 Study Area

The study was carried out at the medical-out patients department of Imo State Specialist Hospital Umuguma, Owerri. Owerri is the capital of Imo state and is located in the Eastern part of Nigeria between longitude 6° 50' E and 7° 25' E and between latitude 4 45 and 7 15 N of the equator with an area of about 5100sq km. It is bordered by Abia state to the North and River Niger and Delta on the West by Anambra state to the North and Rivers state to the south. It provides home for a population of 127,213 people of mainly Igbo ethnic group and a few other tribes. This population is made up of 62,990 males and 64,223 females [6].

2.2 Study Design

A cross-sectional study was carried out from the month of June to August 2023 and all eligible subjects who filled the questionnaire and gave a written informed consent for the study period were sampled. The study population consisted of 50 *H. pylori* infected patient. An equivalent number of age - matched non-*H.pylori* subjects served as the controls. The procedure was carried out at the Imo State Specialist Hospital, Umuguma. The results of the tests were analyzed using SPSS version 21.

2.3 Method of Recruitment

A total of one hundred subjects were recruited for the study (fifty *H.pylori*-infected patients and fifty healthy subjects). Those who gave a written informed consent and completed questionnaires were enrolled in the study.

2.4 Sample Collection

Seven millilitres of venous blood sample was collected at the ante-cubital vein aseptically, 2ml was dispensed into ethylenediaminetetraacetic acid (EDTA) containers, while 5ml was dispensed into plain bottles. The EDTA and plain containers were properly labeled with the subjects' names, sample numbers and date of collection. The blood dispensed into the EDTA containers was stored in a refrigerator at 4°C while the serum was stored in a freezer at -20°C prior to use.

2.5 Ethical Consideration

The research study was approved by the ethics committee of Imo state specialist hospital, Owerri. All study participants who gave their informed consent were enrolled in this study and samples were taken.

2.6 Laboratory Analysis

The packed cell volume was determined using the microhaematocrit method. Red blood cell count was done using the Thoma method (manual counting).

The Ferrozine method was used to determine the serum iron, while the determination of Alpha-Amylase Activity was done using the enzymatic method.

2.7 Statistical Analysis

The generated data was systematically analyzed as appropriate for means, standard deviation, Pearson correlation and Student's test on SPSS software version 21 (California Inc.). Results were presented as mean \pm standard deviation. A two-sided $p < 0.05$ was considered statistically significant.

3 RESULTS

The mean values of PCV (31.36 \pm 3.53) %, RBC (3.93 \pm 4.69) $\times 10^{12}$ /L and serum iron (48.22 \pm 19.66) μ g/dl were significantly reduced in *H. pylori* infected individuals when compared to controls (36.10 \pm 3.37)%, (5.25 \pm 7.13) $\times 10^{12}$ /L and (79.16 \pm 19.32) μ g/dl respectively (t=6.86, t=7.94, t=8.14 and p=0.000). The mean value of amylase was significantly increased in *H. pylori* infected individual (95.15 \pm 34.88) U/L when compared to controls (52.92 \pm 11.44) U/L (t=1.09, p=0.000) (Table 1).

Table 1 Mean Values of PCV, RBC, Iron and Amylase in *H. Pylori* Infected Individual Compared to Controls (Mean SD)

Parameter	Test	Control	t-value	p-value
-----------	------	---------	---------	---------

	50	50		
PCV (%)	31.36±3.53	36.10±3.37	6.86	0.000*
RBC (x10 ¹² /L)	3.93±4.69	5.25±7.13	7.94	0.000*
Iron (µg/dl)	48.22±19.66	79.16±19.32	8.14	0.000*
Amylase (U/L)	95.15±34.88	52.92±11.44	1.09	0.000*

There was no significant difference in the mean values of PCV (32.29±3.49)%, RBC (3.76±3.71) x10⁹/L, Iron (45.18±17.59) µg/dl and Amylase (99.28±37.86)U/L in male H.pylori - infected individuals when compared to female H. pylori infected individuals (30.50±3.40)%, (4.08±5.51) x10⁹/L, (51.04±21.35) µg/dl and (91.35±32.15) U/L respectively (t=1.83, p=0.073, t= 1.06, p= 0.297, t=0.80, p=0.427, and t=0.23, p=0.818) (Table 2).

Table 2 Comparison of the Mean Values of PCV, RBC, Iron and Amylase in H. Pylori Infected Individual Based on Gender

Parameter	Male 25	Female 25	t-value	p-value
PCV (%)	32.29±3.49	30.50±3.40	1.83	0.073
RBC (x10 ⁹ /L)	3.76±3.71	4.08±5.51	1.06	0.297
Iron (µg/dl)	45.18±17.59	51.04±21.35	0.80	0.427
Amylase (U/L)	99.28±37.86	91.35±32.15	0.23	0.818

There was a non-significant positive correlation of amylase with PCV, RBC and Iron in H. pylori - infected individuals (r=0.05, p=0.735; r=0.07, p=0.423 and r=0.16, p=0.328) (Table 3).

Table 3 Correlation of Amylase with PCV, RBC and Iron in H. Pylori Infected Individual

Variable	N	R	p-value
PCV	50	0.05	0.735
RBC	50	0.07	0.423
Iron	50	0.16	0.328

4 DISCUSSION

Helicobacter pylori is one of the major causative factor of peptic ulcer disease [7]. Peptic ulcer is one of the commonest health problems of the stomach, the duodenum and the small intestine, which leads to the development of gastritis especially in developing countries

In the present study, the mean values of PCV and RBC were significantly reduced in H. pylori infected individual when compared to controls. The possible pathogenic mechanism of anaemia could be as a result of blood loss secondary to chronic erosive gastritis and decreased iron absorption secondary to chronic gastritis and hypochlorhydra [8]. Similar findings were reported by Ciacci et al., (2014) [9]. Chronic gastritis due to the ulceration of the peptic wall leads to blood loss which results in the decrease of Hb, PCV and RBC. According Xu et al. (2017) [10], H. pylori-infected individuals were 1.77 times more likely to be anemic compared to their non-infected counterparts. These findings were in agreement with previous studies conducted in Benin [11].

The current study also reveals that serum iron level was significantly decreased in H. pylori infected individual when compared to controls. The possible mechanism that might explain the association between anaemia and H. pylori infection among adult patients may include, consumption of iron by the organism itself, gastrointestinal blood loss due to H. pylori-induced gastrointestinal lesions, and gastritis increased levels of neutrophil-derived lactoferrin, and since H. pylori has a lactoferrin-binding protein receptor, the infection may result in increased iron losses related to bacterial turnover. Since these bacteria have a high turnover rate, a large amount of iron may be lost in stools in the form of dead bacteria [12]. Also, H. pylori chronic gastritis can change the physiology of the stomach, inducing reductions in gastric acid secretion, while acidic intragastric PH was essential for the absorption of dietary iron; thereby inhibiting dietary iron absorption [13]. These findings were in agreement with previous studies conducted in China and the USA. Also, different studies had reported similar findings [14].

This study further revealed that the mean value of amylase was significantly increased in H. pylori infected individual when compared to controls. H pylori-induced pancreatitis in an animal model therefore, on a possible link between the H pylori infection and chronic pancreatitis due to a penetrating gastric ulcer. Singular case reports of humans and carnivores showed a penetration of the pancreas by a giant gastric ulcer [15]. Although, in these rare cases, H pylori colonization has not been addressed, the high prevalence of H pylori in ulcer patients suggests an etiologic relation. The first epidemiological study performed by Niemann et al. (2017) demonstrated that H pylori infection contributes [16], but may not be the only cause of duodenal ulcer in patients with chronic pancreatitis. Their data showed a prevalence of IgG antibodies against H pylori in 60% of patients with chronic pancreatitis complicated by duodenal ulcer, compared to 86% in controls with simple duodenal ulcer. Another study investigated the pathogenesis of duodenal ulcer in chronic alcoholic pancreatitis patients and

found a significant increase in the rate of H pylori infection in patients with chronic alcoholic pancreatitis and duodenal ulcer as compared to patients with chronic alcoholic pancreatitis only [15].

There was no significant difference in the mean values of PCV, RBC and Iron and amylase in male H. pylori infected individuals when compared to female H. pylori infected individuals. This is a clear indication that gender doesn't play a role in the etiology of H. pylori infection. The result is in agreement with study reported by Humeida and Abdalla (2017) [17]. They stated that gender is not a predisposing factor in the progression and severity of H. pylori infection and thus does not affect a particular sex more than the other.

Lastly, there was a non-significant positive correlation of amylase with Iron and PCV in H. pylori Infected Individual. This signifies that amylase cannot be used to predict the level of serum iron and PCV in H.pylori infected subjects. The study is in consonance with study carried out [18].

5 CONCLUSION

H.pylori infection leads to a decline in packed cell volume, RBC and serum iron level. The infection is also marked with an increase in amylase. Gender difference does not have an effect on PCV, RBC, iron and amylase level in H. Pylori infection. There is no association between PCV, iron and amylase in individuals infected with H. Pylori.

COMPETING INTERESTS

The authors have no relevant financial or non-financial interests to disclose.

REFERENCES

- [1] Malfertheiner P, Megraud F, O'Morain CA, et al. Management of Helicobacter pylori infection—the Maastricht IV/Florence consensus report. *Gut*, 2016, 61(5): 646–664.
- [2] Sarari AS, Farraj MA, Hamoudi W, et al. Helicobacter pylori, a causative agent of vitamin B12 deficiency. *Journal of Infectious Disease*, 2018, 2: 346–349.
- [3] Lozano R. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet*, 2016, 380 (9859): 2095–128.
- [4] Underkofler LA, Danault LJ, Hou EF. Enzymes in starch industry Die Starke. *Enzymology*, 2015, 17: 179-184.
- [5] Cullen DJ, Hawkey GM, Greenwood DC. Peptic ulcer bleeding in the elderly: relative roles of Helicobacter pylori and non-steroidal anti-inflammatory drugs. *Gut*, 2017, 41(4): 459–462.
- [6] National Population Commission. Census. Retrieved from the vanguard Newspaper. 2006.
- [7] Akbar DH, El Tahawy AT. Helicobacter pylori infection at a university hospital in Saudi Arabia, prevalence, comparison of diagnostic modalities and endoscopic findings. *Indian Journal of Pathology and Microbiology*, 2015, 48(2): 181-185.
- [8] Kibru D, Gelaw B, Alemu A, et al. Helicobacter pylori infection and its association with anemia among adult dyspeptic patients attending Butajira Hospital, Ethiopia. *British Medical Centre for Infectious Diseases*, 2014, 14 (1): 656-660.
- [9] Ciacci C, Sabbatini F, Cavallaro R, et al. Helicobacter pylori impairs iron absorption in infected individuals. *Liver Disorder*, 2014, 36 (7): 455–460.
- [10] Xu M, Cao B, Yuan B, et al. Association of anaemia with Helicobacter pylori infection. *Scientific Representative*, 2017, 23: 1–7.
- [11] Hou B, Zhang M, Liu M, et al. Association of active Helicobacter pylori infection and anemia in elderly males. *BioMed Central Infectious Diseases*, 2019, 19(228): 1–9.
- [12] Campuzano Maya G. Hematologic manifestations of Helicobacter pylori infection. *World Journal of Gastroenterology*, 2014, 20 (36): 12818–12138.
- [13] Gravina AG, Zagari RM, De Musis C, et al. Helicobacter pylori and extragastric diseases: A review. *World Journal of Gastroenterology*, 2018, 24 (29): 3204–3221.
- [14] Qu X, Huang X, Xiong P, et al. Does Helicobacter pylori infection play a role in iron deficiency anemia? A meta-analysis. *World Journal of Gastroenterology*, 2015, 16 (7): 886–896.
- [15] Boysen SR, Tidwell AS, Penninck DG. Ultrasonographic findings in dogs and cats with gastrointestinal perforation. *Veterinary Radiological Ultrasound*, 2013, 44: 556–564.
- [16] Niemann T, Larsen S, Mouritsen EA, et al. Helicobacter pylori infection in patients with chronic pancreatitis and duodenal ulcer. *Scand Journal of Gastroenterology*, 2017, 32: 1201–1203.
- [17] Humeida AT, Abdalla MH. Association of Helicobacter pylori Infection and Vitamin B12 Level among Sudanese Patients. *IOSR Journal of Dental and Medical Sciences*, 2017, 16 (3): 12-14.

- [18] Annibale B, Capurso G, Lahner E, et al. (2013). Concomitant alterations in intragastric pH and ascorbic acid concentration in patients with *Helicobacter pylori* gastritis and associated iron deficiency anaemia. *Gut*, 52: 496–501.