

The Effect of *Helicobacter pylori* Infection on Vitamin B12 and Some Hematological Parameters among Sudanese Individuals: A Case-Control Study

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Abstract

Background: *Helicobacter Pylori* (*H. pylori*) infection is a major gastric infection worldwide and has been associated with many hematologic disorders. **Objective:** The purpose of this study was to determine the effect of *H. pylori* infection on Sudanese people. **Method:** Blood samples are collected from 60 persons; 30 patient (as sample) and 30 patients (as control sample). Vitamin B12 and complete blood count (CBC) tests are performed. **Results:** The results revealed that Vitamin B 12 level mean was significantly lower among *H. pylori* patients than the controls (p-value 0.013). The results also revealed that there are no significant differences between gender in vitamin B12 level among patients. The correlation between vitamin B12 and age was found to be negative (R=0.444 & P=0.014). **Conclusion & Recommendations:** Vitamin B12 level, HB and RBC are lower in *H. pylori* infected Sudanese individuals compared to the normal people. Thus, we highly recommend for further research and case-control studies in discovering the causal factors related to reduction of vitamin B12 among *H. pylori* infected Sudanese individuals.

Keywords: CBC, *H. pylori*, Sudanese, Vitamin B12.

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INTRODUCTION

Helicobacter. pylori have been suggested as an important agent in the etiology of vitamin B12 deficiency and pernicious anemia [1-3]. *H. pylori* is a type of bacteria responsible for widespread infection with more than 50% of the world's population infected, although 80% of those infected have no symptoms [4]. Infection with *H. pylori* has been considered as a public health problem worldwide and more prevalent in developing than the developed countries [4, 5]. Vitamin B12, which is a water-soluble vitamin, is a complex molecule that cannot be synthesized in the human body and must be supplied in a diet containing meat and dairy products. Upon digestion, B12 is released from

food and complexes with gastric intrinsic factor (IF), the B12-IF complex binds to specific receptors in the ileum where it is absorbed [6].

It has important functions in DNA replication, in the synthesis of red blood, and in maintaining the myelin sheath that surrounds nerve cells [7]. Vitamin B12 deficiency causes pernicious anemia due to lack of production of intrinsic factor by epithelial cells in the stomach. Although many factors can contribute to the development of Vitamin B12 deficiency, pernicious anemia is mostly attributable to conditions associated with chronic atrophic gastritis [7]. This case control study was conducted to evaluate the effect of *H. pylori*

on vitamin B12 and some hematological parameter on Sudanese people.

MATERIALS AND METHODS

This study is a case-control study, conducted in Khartoum city, Sudan. The study protocol is applied as described by Saleh Nazmy Mwafy and Wesam Mohammad Afana with slight modification [8]. Sixty samples (n=60) were included in this study (30 samples from *H. pylori* positive patients and 30 samples from healthy individuals as controls). Patients with already vitamin B12 deficiency, pernicious anemia patient, patients already on steroid or *H. pylori* eradication therapy, anemic patients with the primary disease such as hepatic disease, hemolytic anemia, cancer, aplastic anemia, myeloid proliferative disease red cell aplasia, multiple myeloma, leukemia, chronic lung disease, chronic kidney disease and those using immunosuppressive or chemotherapeutic drugs, pregnant females and alcoholics, patients with history of resection of stomach or small bowel surgery, vegetarian population, patients with malabsorption syndrome and folic acid deficiency were excluded from the study sample. Diagnosis of *H. Pylori* infection was based on the detection of *H. Pylori* antigen in Stool. Five ml of venous blood was collected from each subject: after consent of them, 2.5 ml in EDTA for the blood count, and 2.5ml in lithium heparin container for the estimation of vitamin B12 levels.

Laboratory analysis was performed at Al Riada Laboratory using (AIA360 PACKE), and hematological parameters were determined using automated hematological analyzer (BC-3000Plus). Vitamin B12 levels were determined using Electro chemiluminescence immune assay with a competitive test principle using intrinsic factor (IF) specific for Vitamin B12. Vitamin B12 in the sample competes with the added Vitamin B12 labeled with biotin for the

binding sites on the ruthenium-labeled IF complex. The test procedure consists of three phases of incubation. In the first incubation phase, the sample is incubated with dithiothreitol, sodium hydroxide, and sodium cyanide. In the second incubation phase, the pretreated sample is incubated with ruthenium-labeled IF, and in the third incubation phase, sites on the ruthenium-labeled IF become occupied by ruthenium-labeled IF-Vitamin B12 biotin complex.

The entire complex becomes bound to the solid phase via the interaction of biotin and streptavidin, which is later aspirated to the measuring cell wherein the micro particles are magnetically captured onto the surface of the electrode. Application of a voltage to the electrode then induces the chemiluminescent emission which is measured by a photomultiplier. The measuring range of vitamin B12 assay is 30–2000 pg/ml Statistical analysis was performed using statistical package for social science (SPSS) software. Evaluation of patient's data was performed using the t-test and ($P < 0.05$).

RESULTS

This study was carried on 30 cases; 14 male (47%), 16 female (53%), and 30 control; 8 male (27%), 22 female (7%) with mean age of (Table 1). Vitamin B12 mean was significantly lower among *H. pylori* positive patients (p-value 0.013), RBC mean was significantly lower among *H. pylori* positive patients (p-value 0.004) and hemoglobin mean was significantly lower among *H. pylori* positive patients (p-value 0.000), while HCT mean increased in case rather than control, (p-value 0.000) (Table 1). There is no significance difference between gender in vitamin B12 level (Table 2). Vitamin B12 level was negatively correlated with age ($R = - 0.444$, $P = 0.014$) as this indicates that, an increasing in age lead to decreased in vitamin B12 level Figure (1).

Table 1: Show mean of vitamin B12 and hematological parameters among case versus control group

Parameters	Case (Mean \pm SD)	Control (Mean \pm SD)	P-value
B12	290.50 \pm 69.87	345.97 \pm 96.52	0.013
RBC	4.09 \pm 0.47	4.84 \pm 0.73	0.000
HGB	11.57 \pm 1.45	12.82 \pm 1.76	0.004
HCT	42.83 \pm 7.45	36.69 \pm 4.41	0.000
MCV	89.77 \pm 8.57	87.17 \pm 6.21	0.183
MCH	27.22 \pm 2.01	27.58 \pm 2.22	0.512
MCHC	30.82 \pm 1.92	31.28 \pm 1.028	0.256

The mean difference is significant at the 0.05 level

Table 2: Mean Comparison of Vitamin B12 across the Gender

Gender	(Mean \pm SD)	(P-value)
Male	280.63 \pm 73.62	0.961
Female	279.2 \pm 81.24	

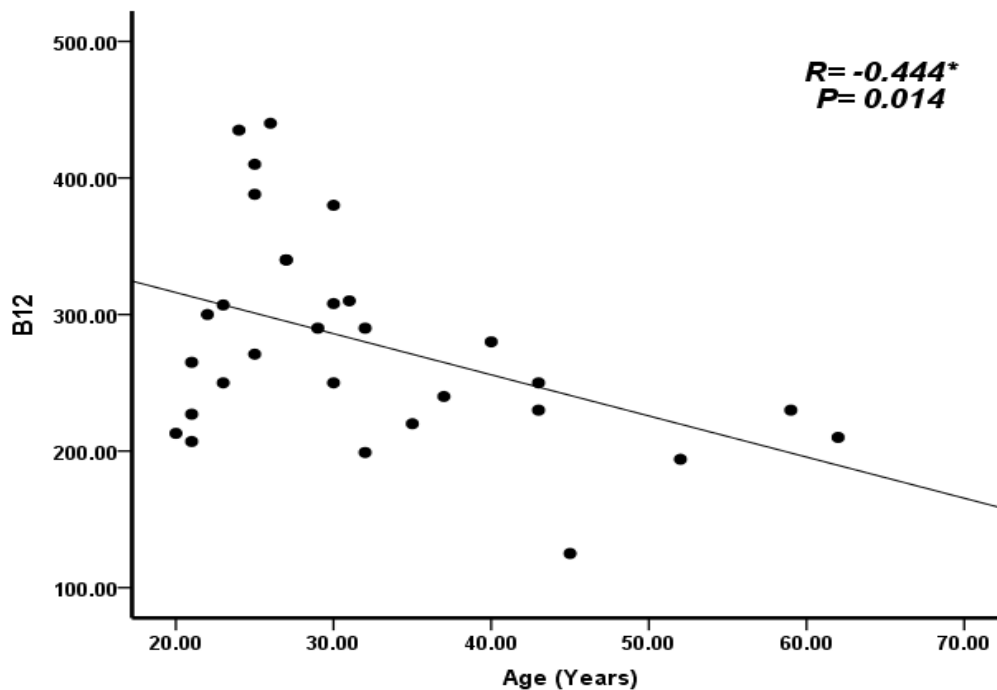


Figure 1: Correlation Between age and Vitamin B12 level

DISCUSSION

During the past decades, several reports indicated a correlation between *H. pylori* infection and various disorders including vitamin B12 deficiency. Vitamin B12 deficiency is a common, often overlooked medical problem in adult population worldwide. The results of the current study showed that *H. Pylori* infection can decrease Vitamin B12 levels were comparing to healthy individuals.

These results agrees with study done by Ahmed T. Humeida and Mahdi H. A. Abdalla in Sudan 2017 in that vitamin B12 level was lower in *H. Pylori* infected individuals rather than control [9]. Another study conducted by Abdel Salam Sarari and others in Birzeit University, State of Palestine, 2008 was found to be in agreement with our case study control in that; vitamin B12 level was lower in *H. Pylori* infected individuals [1]. Bikha Ram Devrajani, Shaikh Muhammad, Syed Zulfiqar Ali Shah, Tarachand Devrajani, Raj Kumar Lohana and Thanwar Das in Pakistan have also proven in 2011 that vitamin B12 level was lower in *H. Pylori* infected individuals rather than control sample [10]. And agrees with the study done by Shrikant C. Rauta, Rittu S. Chande in India 2014 in that vitamin B12 level was also lower in *H. Pylori* infected individuals rather than control [9].

CONCLUSION

The current study concluded that vitamin B12 level was lower in *H. Pylori* infected Sudanese individuals. Therefore, we highly recommend for further research and case-control studies in discovering

the causal factors related to reduction of vitamin B12 among *H. pylori* infected Sudanese individuals.

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