

Citation: Layla E. El Mahadi, Suhair A. Ahmed, Omaima A. Ahmed. Assessment of Serum Calcium, Phosphorus and Alkaline Phosphatase Concentrations among Patients attending Omdurman Teaching Hospital with *Helicobacter pylori* Infection. African Journal of Medical Sciences, 2019, 4 (2), ajmsc.info

Assessment of Serum Calcium, Phosphorus, and Alkaline Phosphatase Concentrations among Patients attending Omdurman Teaching Hospital with *Helicobacter pylori* Infection

Layla E El Mahadi¹, Suhair A. Ahmed¹, Omaima A. Ahmed².

¹Al Neelain University, Khartoum- Sudan.

²Sudan International University, Khartoum- Sudan.

Abstract

Background: *H. pylori* infection has been linked to many disorders like autoimmune thyroid diseases, diabetes, osteoporosis and primary hyperparathyroidism, *H. pylori* infection can induce individual inflammatory and immune reactions, which can regulate bone turnover. Several research studies have reported that *H. pylori* infection is a risk factor of different disorders..

Objective: To assess the concentrations of serum calcium, phosphorus and alkaline phosphatase among Sudanese patients presenting with *H. pylori*.

Materials and methods: This was a case-control study conducted from March to April 2018. 30 blood specimens were collected from diagnosed *H.pylori* infection patients (test group) at Omdurman Teaching Hospital. Another 30 blood specimens were collected from apparently healthy participants (control group). The concentrations of calcium, phosphorus and alkaline phosphatase (ALP) were measured by Mindray BS-120.

Results: There was a significant decrease in the levels of calcium in patients with *H. pylori* infection ($p = 0.000$) when compared to the control group. The (Mean \pm SD) of calcium was (8.31 ± 0.42 mg/dl) in test group patients. The (Mean \pm SD) was (9.28 ± 0.69 mg/dl) in control participants group . There was a significant increase in the concentrations of phosphorus and ALP in patients with *H. pylori* infection ($p = 0.010$ and 0.000 respectively) when compared to control participants. The (Mean \pm SD), of phosphorous and ALP were (4.03 ± 0.68 mg/dl and 118.3 ± 21.66 mg/dl respectively) in patients with *H. pylori* infection and were (3.63 ± 0.45 mg/dl and 92.20 ± 19.15 mg/dl) respectively in control participants. There was a significant positive correlation between concentrations of phosphorus and ALP and age incidence with ($R= 0.468$; $p = 0.009$ and $R=383$, $p = 0.037$ respectively).

Conclusion: There was a significant decrease in the concentrations of calcium in patients with *H. pylori* infection when compared to the control group participants. There was a significant increase in the concentrations of phosphorus and ALP in patients with *H. pylori* infection when compared to control group participants. There was a significant positive correlation between the concentrations of phosphorus and ALP with age incidence among patients with *H. pylori*.

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Keywords: Calcium, phosphorus, ALP, *H. pylori*, Mindray BS-120, Sudanese patients

Introduction

Helicobacter pylori (*H. pylori*) is one of the most widespread chronic bacterial infections throughout the world and is estimated to have infected approximately half of the global population. However, the worldwide distribution of the prevalence rate of *H. pylori* infection is not homogenous. In recent decades the infection prevalence rate in western countries was decreasing. While the prevalence rate of *H. pylori* infection in developing countries was over 80%, and 20-80% in developed countries¹.

In *H. pylori* infection, levels of tumour necrosis factor-alpha, cytokines (interleukine-1 and interleukine-6) were increasing. The increase in these factors has been shown to contribute to the process of chronic infections, and supported the assumption that patients with *H. pylori* infection are risks of chronic bacterial infection. Several underlying diseases can reduce the bone mineral content, e.g. genetic and acquired infections, osteoporosis, inflammation, endocrine disorders, organ transplantation, chronic inflammatory diseases, cancer, and gastrointestinal diseases. Chronic inflammatory diseases decrease bone formation and increase bone resorption. Various biochemical markers are now available that allow a specific and sensitive assessment of the rate of bone formation and bone resorption of the skeleton. One of the parameters considered to reflect bone formation is serum total alkaline phosphatase².

Chronic gastritis due to *H. pylori* infection may lead to decreased bone mineral density (BMD) and predispose patients to osteoporosis. Several research studies had reported that *H. pylori* infection is a risk factor. However, there is limited information on the bone mineral metabolism in patients with *H. pylori* infection³.

The present study had assessed the concentrations of bone minerals (calcium, phosphorous and ALP) among Sudanese patients with *H. pylori* infection.

Materials and methods

This was a cross-sectional, case control study conducted at Omdurman Teaching Hospital during the period from March to April 2018. Inclusion criteria include all patients presenting with *H. pylori* infection. Exclusion criteria were any patient with a past history of osteoporosis, alcoholism, smoking, chronic liver disease, chronic renal disease, and menopausal women. The study was approved by the Scientific Research Committee of Al Neelain University. Permission to collect the specimens was granted by authorities of Omdurman Teaching Hospital. All study participants were informed with the aims of the study and its importance, and a verbal consent was obtained from each participant. Data was analyzed using the SPSS program, version 21. The results were expressed as percentages, mean, and standard deviation (SD). Independent T-test was performed to compare the study parameters in cases versus control groups. Correlation was done to study the relationship between study parameters and study variables. A p-value less than 0.05 was considered as significant. A well-structured questionnaire was used to collect clinical and demographical data of all participants.

30 blood specimens were collected from diagnosed *H.pylori* infection patients (test group) at Omdurman Teaching Hospital. Another 30 blood specimens were collected from apparently

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healthy participants (control group). Blood specimens were collected from all study population, and serum was separated. The concentrations of calcium, phosphorus and alkaline phosphatase (ALP) were measured by Mindray BS-120. Pathological and normal control sera were included and analyzed to assure accuracy and precision of results.

Results

The (Mean \pm SD) of calcium was (8.31 \pm 0.42mg/dl) in test group patients; and the (Mean \pm SD) of calcium was (9.28 \pm 0.69mg/dl) in control participants group. The (Mean \pm SD), of ALP and phosphorous were (4.03 \pm 0.68 mg/dl and 118.3 \pm 21.66 mg/dl respectively) in patients with *H. pylori* infection and were (3.63 \pm 0.45mg/dl and 92.20 \pm 19.15mg/dl respectively) in control participants.

Statistical analysis showed a significant decrease in the concentration of calcium among patients with *H. pylori*, when compared with control participants ($p = 0.000$). While a significant increase in the concentrations of phosphorus and alkaline phosphatase was found among patients with *H. pylori*, when compared with control group participants ($p = 0.010$).

Regarding gender incidence, insignificant association was found in the concentrations of calcium, phosphorus and alkaline phosphatase among male and female patients with *H. pylori* when compared with male and female control participants ($p = 0.151$, $p = 0.867$, $p = 0.287$ respectively)

There was a significant positive correlation between the concentrations of phosphorus and ALP with age incidence among patients with *H. pylori* ($R = 0.468$, $p = 0.009$ and $R = 0.383$, $p = 0.037$ respectively).

While there was no correlation between the concentration of calcium and age incidence of patients investigated.

On the other hand, Fig. (1) exhibits a significant negative correlation between the concentrations of calcium and phosphorus among patients presenting with *H. pylori* infection. ($R = -0.546$, $p = 0.002$).

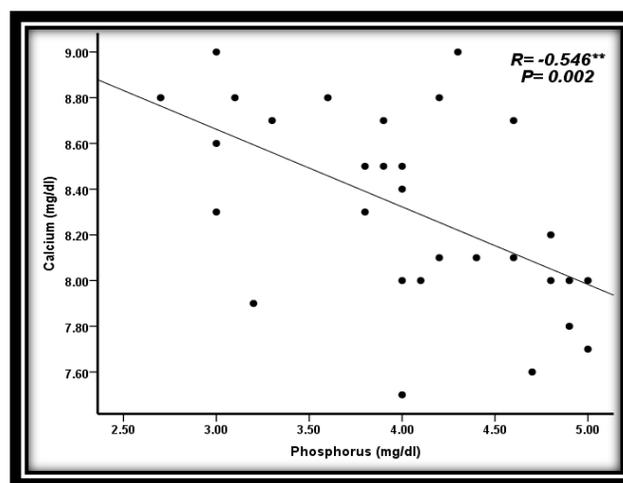


Fig. (1): Correlation between calcium and phosphorus concentrations among patients presenting with *H. pylori* infection.

Discussion

Helicobacter pylori (*H. pylori*) is a known cause of gastritis and peptic ulcer, and is associated with systemic inflammation. In addition, *H. pylori* infection has been linked to many other disorders like autoimmune thyroid diseases, diabetes mellitus, dyslipidemia, obesity, osteoporosis, and primary hyperparathyroidism⁴.

In the present study, ALP showed a significant increase in patients with *H. pylori* infection when compared with control participants ($p = 0.000$). This finding agrees with the findings of Gong and his colleagues⁵ who investigated the relationship between *H. pylori* infection and serum analytes concentrations and reported a correlation of *H. pylori* infection with high ALP levels.

Also, in the present context, the phosphorus mean level showed a significant increase in patients with *H. pylori* infection when compared with the control participants ($p = 0.010$). The level of calcium also showed a significant decrease in case group when compared with the control group participants ($p = 0.000$). These results were found incompatible with the findings of the study conducted by Ozdem and his co-workers⁶, who investigated the biochemical markers of bone metabolism in children with *Helicobacter pylori* infection. They reported that *H. pylori* infection may cause time-dependent changes in bone turnover markers during the long course of the disease.

Furthermore, the present study analytes variations could be attributed to the gastric atrophy that might be caused by chronic *H. pylori* infection, which would decrease the acid secretion. The hypochlorhydric stomach affects calcium absorption and calcium homeostasis⁷.

This study also revealed insignificant association in the concentrations of calcium, phosphorus and ALP among male patients with *H. pylori* infection, when compared with females ($p = 0.151$, $p = 0.867$, $p = 0.287$ respectively). In addition, there was a positive correlation between the levels of phosphorus and ALP age incidence among *H. pylori* infection patients ($R = 0.468$, $p = 0.009$, and $R = 0.383$, $p = 0.037$ respectively); however, there was no correlation between the levels of calcium and age incidence among the test group patients.

Conclusions: There was a significant decrease in the concentrations of calcium in patients with *H. pylori* infection when compared to the control group participants. There was a significant increase in the concentrations of phosphorus and ALP in patients with *H. pylori* infection when compared to control group participants. There was a significant positive correlation between the concentrations of phosphorus and ALP with age incidence among patients with *H. pylori*.

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