Journal of Kufa for Chemical Sciences
ISSN(P) :2077-2351 ISSN(E): 3006-3280
Journal Homepage:
https://journal.uokufa.edu.iq/index.php/jkcs/index

Article

Determination of Zinc, Copper and Antioxidant Vitamins in Iraqi Patients with Celiac Disease

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Abstract

Celiac disease is a complicated and clinical disorder results from incapability of the immunity system to complete the metabolic reaction which is responsible for benefit of gluten protein abundant in plants foods such as wheat, barley and rye. Vitamins A and C were determined by Elisa technique whereas trace elements (copper and zinc) were determined Spectro-photometrically. Therefore, the present research was employed to investigate and measure the concentrations of some vitamins and trace elements in Iraqi celiac patients according to body mass index and family history factors. It was found high significant increases (*** $P<0.0001$) of concentrations of antioxidant vitamins A was recorded celiac patients in comparison with healthy persons (control groups), depending on body mass index variable and significant decrease (** $P<0.001$) in concentrations of vitamins A and C according to family history variable. The Trace elements (Cu) showed a significant decrease (** $P<0.001$) in Its concentrations values according to body mass index variable especially at obese status. Also, significant decrease in Zn concentration and increases in Cu concentration (* $P< 0.05$) was noticed the celiac patients which have family history. compared with the patients having no family history. As conculsion, body mass index and family history are important variables for estimation of vitamin A, vitamin C, copper and zinc concentrations in celiac patients.

Keywords: Celiac Disease (CD), Vitamin C, Vitamin A, Body mass index, Cop

Introduction

Celiac disease (CD)is a clinical and healthy disorder resulting from biochemical defect in autoimmunity of human body because eating of some foods such as wheat, barley or rye which have gluten protein. So this statement causes biological problems in micro intestines leading to forbid the biochemical absorption of nutrients (1,2). |Therefore, the intestines are infected by great damage leading to high alteration in gluten concentration in the human being body and this process is named malabsorption. Also, the dangers in the small intestine causes many symptoms like weight loss, diarrhea, fatigue, bloating and anemia (3,4). Because celiac disease (CD) infects most people especially adults and children therefore different health organisations and medical centres established multi research about the dangerous of this disease. Also, the biochemists and doctors carrid out out various studies to investigate the reasons of severity of this risk disease and they achieved fantastic outcomes dealing with the biochemical and clinical factors effecting the progress of CD (5,6). Also many clinical studies was established concentrning of antioxidant enzymes such as glutathione reductase, superoxide dismutase, catalase and glutathione-S- transferase , and non-enzymatic antioxidant represented vitamins(A,E and C), uric acid, aldehyde malon, albumin bilirubin and trace elements (Zn,Cu and Se). Also these studies indicated to the biochemical relationship between the clinical parameters and celiac patients features such as age , body mass index, blood group, family history ,sex, other diseases infection and smoking (7,8). Previous research proved the biochemical correlation between the concentrations values of antioxidant vitamins (E,A and C) with the levels of diverse trace elements like copper, selenium, cadmium, zinc, nickel, calcium and magnesium. At the same time there were significant differences in concentrations of antioxidant vitamins (E and A) in patients with celiac disease compared with healthy participants according to body mass index variable. Also perstudies outcomes showed existence of significant differences in the concentration of trace elements (Zn, Cd, Ni, Se and Cu) belonging to CD patients in comparison with healthy subjects depending on family history variable(9,10,11).Consequently, the our present study was focused on investigation and measurement of oxidant-antioxidant status represented by antioxidant vitamins (A and C) and their clinical correlations with concentration of trace elements (Zn and Cu) in patients with celiac disease in Basrah Governorate-Republic of Iraq depending on body mass index and family history factors.

Materials and Methods

Participants and Their Merits

Total number of subjects represented by on hundred one were participate in the current study. They were classified into two groups , the first represents to celiac patients with number equal to forty six subjects whereas the second group expresses healthy

individuals with number equal forty five persons and this is considered as control group. The total patients with CD were enclosed that they haven't other diseases besides celiac disease. The all subjects (patients and healthy) were classified into body mass index variable into there categories , the first is normal, the second is overweight and the third is obese. Also the all CD patients were divided into two groups, the first (have family history) and the second (have no family history).

Ethical Approval

The all managerial official orders were issued from Education college of Pure Sciences at University Basrah and Al- Fayhaa teaching hospital-Directorate of Health in Basrah Covernorate.

Location and Blood Sampling

The whole blood samples were got from healthy persons and patients with CD and these total samples were obtained from all subjects at 9:00 AM by a trained special nurse in Al-Fayhaa teaching hospital-Basrah city. Republic of Iraq. After that the tow types of samples (patients and healthy) were retained carefully. Five millisters of blood was withdrawn from venous blood for all participants in the present study. Hence all blood samples were hold in vacutainer glass tubes after that they were centrifuged with speed equal to 5000 rpm for nine minutes. The total number of blood samples were gathered and kept at 26 C for investigation and assessment of biochemical parameters while the enduring blood was placed in special tube for the sake of separation of blood plasma. After that, the red blood cells were washed gently by using sodium chloride (9% w/v) then the mixture was underwent lyzation process using (1:1v/v) deionised water (12,13).

Measurement of Biochemical Parameters Levels

The total concentrations of antioxidant vitamins (A and C) were investigated and measured in all blood samples (CD patients and healthy subjects) according to enzyme-linked immunosorbent assay (ELISA) method by enzymatic-characteristics kits (14). Concentrations of trace elements (Cu and Zn) also were measured in the total blood sera belonging to CD patients and healthy persons (control groups) by using spectrophotometric technique depending on the absorbance values recorded which are proportional with formed complex color and its wavelength (15).

Statistical Analysis

The synoptic data values belonging to the concentrations of antioxidant vitamins (A and C) and trace elements (Cu and Zn) were represented in accordance with statistical programme of social sciences
(SPSS, version 25). Also the overall concentrations of vitamins and trace elements were expressed as mean ± standard deviation for all participants (CD patients and healthy

subjects)in accordance with body mass index and family history factors. The aggregate significant differences between patients with CD and healthy individuals (control groups)were measured depending an univariate program .also the concentrations means values were differentiated between CD patients and control groups via values of regression coefficient (Cr) .The significant increasing and decreasing were represented as P-value hasing the lowest limit less than 0.05 for the significance.

Results

Celiac disease (CD) is considered as one of healthy problems which causes the risk in the digestive system especially in the small intestines because of clinical disorder in autoimmunity system. This status makes intestines are unable to absorb the nutrients from foods such as wheat, rye or barely.

There is a biochemical relationship between concentration of antioxidants vitamins A and C recorded in the blood sera of CD patients with body mass index (BMI) factor as shown in table (1).

Table 1: Concentrations values of antioxidant vitamins (A and C) in blood sera of CD patients and control group according to body mass index factor.

Body mass index status	Subjects groups	Concentrations of antioxidant vitamins	
		Vitamin A (ng/ml)	Vitamin C (µg /ml)
Normal	CD Patients No.=20	188.725±64.0204	18.2330±7.75594
	Control group No.=21	640.048±418.2326	14.5814±2.36815
Over wight	CD Patients No.=18	190.178±65.5229	15.8067±6.99674
	Control group No.=14	647.286±425.7295	13.5786±1.66788
Obese	CD Patients No.=8	196.763±82.6480	14.9150±3.42346
	Control group No.=10	690.300±437.5401	14.5200±2.52005

Concentration were represented as mean±SD,* * *P<0.0001,* * P<0.001, *P<0.05, N.S:Non significant Diverse values of concentration of antioxidant vitamins (A and C) were measured were equal to 188.725±64.0204 and 18.2330±7.75594 respectively in blood sera of CD patients at normal category of patients whereas the same vitamins showed two various values of concentration represented by190.178±65.5229 and 15.8067±6.99674 respectively in the same patients at overweight states in the obese category of body mass index of patients with CD disease the concentrations values of vitamin A was 196.763±82.6480 but in vitamin E was 14.9150±3.42346 for the same CD patients.

Family history factor is correlated biochemically with the levels of vitamin (A and C) belonging to patients with celiac disease. Subsequently, table (2) indicates the concentrations of antioxidant vitamins (A and C) in blood sera of CD patients according to family history variable.

Table (2): Concentrations values of antioxidant vitamins (A and C) in blood sera of celiac patients and control groups according to family history factor

Family history states	Concentrations of antioxidant vitamins	
	Vitamin A (ng/ml)	Vitamin C (µg /ml)
Have family history (No.=31)	197.306±72.5023	17.5519±7.22527
No family history (No.=15)	177.020±51.5425	14.9593±6.03546

Concentration were represented as mean±SD; * * *P<0.0001; * * P<0.001, *P<0.05, N.S:Non-significant

Assorted values of concentrations were recorded equal to 197.306±72.5023 and 17.5519±7.22527 for vitamins (A and C) respectively in blood sera of celiac patients having family history whereas the concentrations were measured to be equal to 177.020±51.5425 and 14.9593±6.03546 for the both vitamins (A and C) respectively in the CD patients which have no family history.

Trace elements are considered as one of clinical markers to follow the severity of celiac disease according to body mass index factor. Table (3) shows the concentrations values belonging to the trace elements (copper and zinc) in CD patients depending on body mass index factor

Table (3): Concentrations values of trace elements (Cu and Zn) in blood sera of CD patients and control groups according to body mass index variable.

Body mass index states	Subjects groups	Concentration of trace element	
		Copper (µg/dl)	Zinc (µg /dl)
Normal	CD Patients No.=20	133.70±25.163	93.05±24.767
	Control group No.=21	126.19±22.875	92.33±26.158
Overweight	CD Patients No.=18	131.61±32.008	93.22±24.795
	Control group No.=14	126.19±16.679	95.71±27.628

Obese	CD Patients No.=8	127.75±21.933	100.13±34.676
	Control group No.=10	120.90±24.127	102.00±35.387

Concentrations were represented as mean±SD, * * *P<0.0001, * * P<0.001, *P<0.05, N.S:Non-significant

The concentrations measured for copper and zinc were found to be equal to 133.70±25.163 and 93.05±24.767 In blood sera of celiac patients in case of normal body mass index whereas the same trace elements (Cu and Zn) recorded the concentration represented by 131.61±32.008 and 93.22±24.795 in patients with celiac disease at overweight status belonging to body mass index variable. Also two diverse values of copper and zinc concentrations were measured equal to 127.75±21.933 and 100.13±34.676 in blood sera of CD patients at obese status.

The clinical influence of family history variable is very important to know the severity and complication of celiac disease and its correlation with levels of trace elements especially copper and zinc. Table (4) indicates the chemical bio role of family history factor in alterations of concentrations values belonging to Cu and Zn elements in blood sera of celiac patients .

Table (4) : Concentration values of trace elements (copper and zinc) in blood sera of CD patients and control groups according to family history factor .

Family history status	Concentrations of trace element	
	Copper (µg /dl)	Zinc (µg /dl)
Have family history (No.=31)	136.16±25.112	93.68±26.146
No family history (No.=15)	122.93±29.678	95.73±27.117

Concentrations were represented as mean±SD, * * *P<0.0001, * * P<0.001, *P<0.05, N.S:Non-significan

It was noticed that the trace elements (copper and zinc) showed two different values of concentrations equal to 136.16±25.112 and 93.68±26.146 respectively in blood sera of celiac Patients having family history while the same trace elements recorded values of concentrations represented by 122.93±29.678 and 95.73±27.117 respectively in blood sera of celiac disease patients which have no family history.

Discussion

The clinical significance of any disease results from its danger on the health of human being , hence complications of disease leads to diverse health problems (16) .Therefore the present study was achieved about celiac disease which is considered as one of clinical and biochemical disorder that infect the human body especially children

subsequently , the biochemical parameters represented by antioxidant vitamins (A and C) and trace elements (Cu and Zn) were investigated in the patients with celiac disease and their relationship with body mass index and family history factors .The concentrations of vitamins (A and C) recorded high significant increase (***P<0.0001) in CD patients compared to healthy participants (control groups) according to body mass index variable especially at the normal and overweight statements. The highest value of vitamin A concentration was found in CD patients at obese category whereas the lowest concentration of this vitamin was noticed at normal statement. Also, vitamin C recorded the maximum concentration in blood sera of celiac patients at obese category of body mass index while the minimum value of vitamin C concentration was found in CD patients at normal status belonging to body mass index variable. The clinical relationship between levels of vitamins A and C and body mass index variable in patients with CD disease (17,18) . The oxidative stress represents biochemical markers for following the intensification of celiac disease and this case is represented by antioxidant vitamins especially A and C .Subsequently, variations in the values of this vitamins are considered as indicators for following the celiac patients with different body mass index (19) the clinical correlation between antioxidant vitamins and family history factor ,is explained and discussed in detail concerning the celiac disease. Vitamin A recoded high significant increase (***P<0.0001) in it's concentration in blood sera belonging to celiac patients having family history whereas vitamin C showed high significant decrease(***P<0.0001) in its concentration for CD patients which have no family history .The highest values of vitamin A and C were noticed equal to 197.306±72.5023 and 93.68±26.146. In celiac patients having family history while the minimum concentrations were122.93±29.678 and 95.73±27.117 for vitamins A and C respectively in celiac patient which have no family history. Our study was in agreement with other study was carried out to determine vitamins A and C vitamins in celiac patients having family history (20) . Trace elements are considered as one of biochemical parameters which are examined and evaluated in CD patients having assorted statements of body mass index. Also these elements have clinical and biochemical relationship with oxidant-antioxidant status which are associated chemically with oxidant stress belonging to CD patients (21) . In the our current study, high significant increase (***P<0.0001) was found in the concentrations of copper and zinc in celiac disease patients according to body mass index especially at overweight and obese categories compared with control groups. The greatest values of zinc and copper concentrations were recorded at the obese and overweight statements of body mass index whereas the lowest values were noticed in the obese patients with CD. The biochemical roles of trace elements in oxidative stress status, are represented by that these trace elements are found in various levels but zinc is abundant in low concentration in celiac proteins leading to zinc deficiency. This case is associated with intestinal malabsorption of zinc and this leads to gluten withdrawal and also CD patients which have gluten -sensitivity enteropathies (22,23) .Also the trace elements levels in

celiac patients are associated clinically with family history variable so in the present study copper element recorded high significant increase (* * *P<0.0001) in its concentration in CD patients having family history whereas zinc element showed low significant decrease (* * *P<0.0001) in celiac patients which have family history. Also copper concentration increased and Zn concentration decreased in celiac patients which have no family history . The clinical correlation between levels trace elements such as (Cu and Zn)and family history factor was proved in CD patients. The explanation of this relationship belongs to occur a damage in the intestinal layer leading to its inability for proper absorption of zinc elements (24,25)

Conclusions

From the results obtained in our current research,we proved and confirmed the biochemical relationship among biochemical variables represented by antioxidant vitamins (A and C) and trace elements (Zn and Cu) with celiac disease. Also it was concluded that body mass index and family history factors are clinically associated with oxidative stress represented by vitamins (A and C) and trace elements (Cu and Zn) existing in the blood sera of celiac disease patients. Subsequently, , the vitamins and trace elements in the present study are considered as biochemical indicators for following the severity of celiac disease.

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