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A comparative study a Copper and Zinc for colon cancer patients

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***Abstract*---**Given the importance of trace elements in the human body and their strong relationship to the incidence of many diseases such as cancerous diseases, so many studies have been conducted on these elements to reduce such diseases. Through our study, 30 samples of healthy blood serum were taken from the blood bank in Najaf Governorate and 47 samples of blood serum from patients with colon cancer, which were divided between males and females for the elements copper and zinc from the Middle Euphrates Cancer Center, using atomic absorption spectroscopy, the concentrations of the two studied elements were measured. The values of copper concentrations for healthy and patients were lower than the internationally recommended normal values (0.7-1.4), and through the results that we also obtained for healthy males and females, zinc was higher than the recommended normal, and the result was the opposite for colon patients. There was no statistical significance for the copper concentration between healthy people and patients for the male and female (p-value > 0.05), to calculate the increase in the average levels of copper concentrations for colon patients. As for zinc, the average concentration of healthy males and females was higher than the group of colon patients, and the comparison was highly statistically significant. (p-value< 0.05), with regard to the correlation factor was strong and positive and statistically significant only for zinc element concentrations between healthy males and females. Therefore, our study can be considered a preliminary study on the two studied elements, which requires a larger study at the level of more governorates.

***Keywords*---**colon cancer, trace elements, SPSS Program, atomic absorption spectroscopy.

Introduction

There are two faces about trace elements, they are beneficial and/or toxic. Minerals form only 5% of the typical human diet but are essential for normal health and function. For the known essential elements, essentiality and toxicity are unrelated and toxicity is a matter of dose or exposure. In the past years, considerable research has been carried out to better understand the physiological role and the health consequences of trace elements [1].Trace elements are elements that are required in small quantities to maintain life, and their absence or deficiency in an organism leads to death or frightening dysfunction.[2] [3]. In all essential trace elements within certain limits can be considered toxic to humans and animals if the food intake is large or continues for a relatively long time [4].The main distinction between heavy metals and trace elements is that heavy metals are generally harmful at extremely low quantities, whereas trace elements are not dangerous at such low amounts [5]. Many trace elements have multiple functions depending on their chemical or compound formula and are located in tissues and body fluids [6]. Trace elements are essential for the functions of many mineral proteins and enzymes, it also plays an important role in regulating gene expression, and is essential for growth, defense, bone strength and blood cell production [7].

Leukemia, as well as neurological diseases, osteoporosis, and connective tissue disorders Toxicity from excess copper is very rare and can result primarily from contaminated water[1, 8]. In many studies, colorectal cancer (CRC) can be considered the third most common cancer in most parts of the world with a projected one million new cases and 500,000 new cases deaths each year[9]. There is a belief that colorectal cancer is caused by a complicated combination of hereditary susceptibility to infection with influences, for example, evidenced because of genetics, experimental as well as epidemiological research [10] .Approximately 75% of patients have no obvious family history or any recognized diseases. predisposition [11]. According to the observational studies that have been done, the CRC development may be linked to variables such as excessive calorie intake, red meat consumption (particularly if it is overdone) [12]. as well as high saturated fat intake fats, minimal usage of fruits, vegetables and fiber, excessive amounts of Alcohol, Obesity, tobacco use, and sedentary behavior[13], because of the importance of heavy metals in biochemical and physiological processes, the study of heavy metals in human tissues has grown in popularity in recent years[14]. It is also crucial to highlight that heavy metals play a vital role in human health and illness. Furthermore, radioactive elements can damage human blood[15]. These elements are required in many metabolic processes of cells and tissues. Each essential and non-essential trace element can be harmful at high amounts in cells, tissues, and fluids. Some kinds of cancer originate or worsen as a result of trace element deficiency or excessive increase[16].

The carcinogenic risk of Cu is variable.. When Cu is overloaded, it can cause FR, lipid peroxidation, DNA, and protein damage due to the interchange of its distinct oxidation forms, as well as increase the onset and growth of tumors . Second, Cu poisoning can cause cancer cells to die due to membrane lipid peroxidation, as well as prevent tumor incidence and progression [17]. Third, because cancer cells require more copper than normal cells, they modify the copper metabolism

pathway to increase Cu consumption during growth and replication [18].Tumor patients may also have low serum Cu levels. In terms of cancer, Cu is rare. Cu overload is linked to an increase in cancer incidence and risk. Cu has a role in cancer initiation, growth, development, and metastasis. However, both Cu excess and copper deficiency can be used to treat cancer[19] .Serum Cu levels in patients with liver cancer, lung cancer, brain cancer, breast cancer, and gastric cancer are lower than in the control group, and Cu excess is associated with a lower risk of cancer in breast, stomach, lung, and brain malignancies, this may be used to demonstrate that these cancer patients may eat a significant quantity of Cu stored in their bodies. Patients with colorectal cancer and esophageal cancer had considerably greater blood copper levels than the control group. This might be due to the because that these patients are at an advanced stage of tumor growth, such as invasion or metastasis [20].

Zn is a trace element that is necessary for health but hazardous at larger concentrations[21]. Because Zinc is gradually replacing lead in gasoline across the world, an assessment of possible cancer risks is critical [22]. There are a few studies in the literature that look at the consequences of excessive Zinc oral intake in humans. Furthermore, there is no evidence of Zinc's carcinogenicity (ability to cause cancer) in humans or animals [23]. This study aims to identify some trace elements in blood serum in Iraq. Using the atomic absorption spectroscopy technique and studying the distribution of these elements compared to the healthy group also can say, this work contributes to an accurate visualization of the possibility of monitoring one of the types of malignant diseases by correlating the concentration of some trace elements in the serum, as well as access to early detection as Copper and Zinc.

Experimental Methods

Sample collection

After an overnight fast, blood samples are taken from the subjects made by collecting venous blood in 5 ml Vacutainer tubes (Becton Dickinson). Blood samples were centrifuged at 3000 rpm for 5 min .The serum was stored in a refrigerator at 2-8°C Up to analysis within 24 hours**.** Serum assay was obtained with a physical device (atomic absorption spectroscopy). With the help of the Oncology Center staff, a collection of 47 samples of blood serum from colon cancer patients were collected from the Middle Euphrates Center for Cancerous Tumors in Najaf Governorate, divided into 24 females and 23 males, and 30 samples of blood serum from healthy people were collected from the blood bank, which was divided into 15 males and 15 females, the blood samples, they were taken by syringe from the people, then the dye was separated from the plasma by a centrifuge and stored in an Abendouf tube stored in a refrigerator prepared for measurement. where the serum samples were digested according to the procedures [24]. After preparing the samples, they were sent to the laboratory for the to measure of measuring the concentration of studied trace elements ,Copper (Cu) and Zinc (Zn). Using the Flame Atomic Absorption Spectrophotometer 6300 (AAS) and before the measurement the device was calibrated for the elements Where different concentrations of standard solutions of copper and zinc were

taken for three dilute concentrations in which the system was calibrated [25],as in the figures below.

Statistical analysis

The SPSS version 20 program was used to analyze the data, the independent test was used for the samples, where if the p- value is less the 0.05 that means the relation between the concentration of groups is statistical significance but if large than 0.05 non significance value.

Result and Discussion

The study included two groups, the healthy group and the Patient's group (colon cancer) for each gender, the average age, mean ±Std .Deviation for concentration of copper and Zinc (ppb),the p -value for each group was calculated as shown in Table 1.

Table 1
The descriptive data of patients and healthy samples for Cu and Zn trace elements

sex	Studies groups	No.	Cu(ppb)		Zn(ppb)	
			mean ±Std .Deviation	P value	mean ±Std .Deviation	P value
M	healthy people	15	45.790±53.947017	.118	1984.613±613.632	0.000
	Colon cancer	23	119.867±214.435		887.249±670.235	
F	healthy people	15	152.453± 67.010	.643	1588.834± 81.4604.257	.022
	Colon cancer	24	176.809±239.991		902.518±112.2392	
			(0.7 – 1.4) ppm	[25]	(0.5 – 1.2)ppm	[25]

M: male, F: female

From Table 1, we notice that the Copper concentrations mean± Std .deviation (45.790±53.947017) of healthy males is less than the concentration mean Std .deviation (119.867±214.435) of the male colon cancer patients, and the no significance of the differences between the studied results, in contrast to the Zinc element, the average of the healthy was higher than the average of colon cancer patients and with statistical significance between the results (p - value = 0.00) less than 0.05. As for the studied blood serum samples for females, the average concentrations of Copper concentration levels mean± Std .deviation (152.453± 67.010) in healthy females were lower than those in colon patients (176.809±239.991), with a no statistical significance for the increase in the average of colon cancer females. While the levels of Zinc in healthy females were higher than those with colon cancer, with high statistical significance (p – value = 0.00). Among the figures that drew the relationship between the studied groups, where figures (1.a) and(1.b) for the comparison between healthy males and colon cancer for Copper concentration, healthy females and colon cancer show that in general, healthy males and females have a less percentage of colic patients reverse the behavior of Zinc shown in Figures (1.c) and (1.d). The values of copper

and Zinc concentrations in the blood serum of healthy and colon patients were compared with different international studies as shown in Table 2 below.

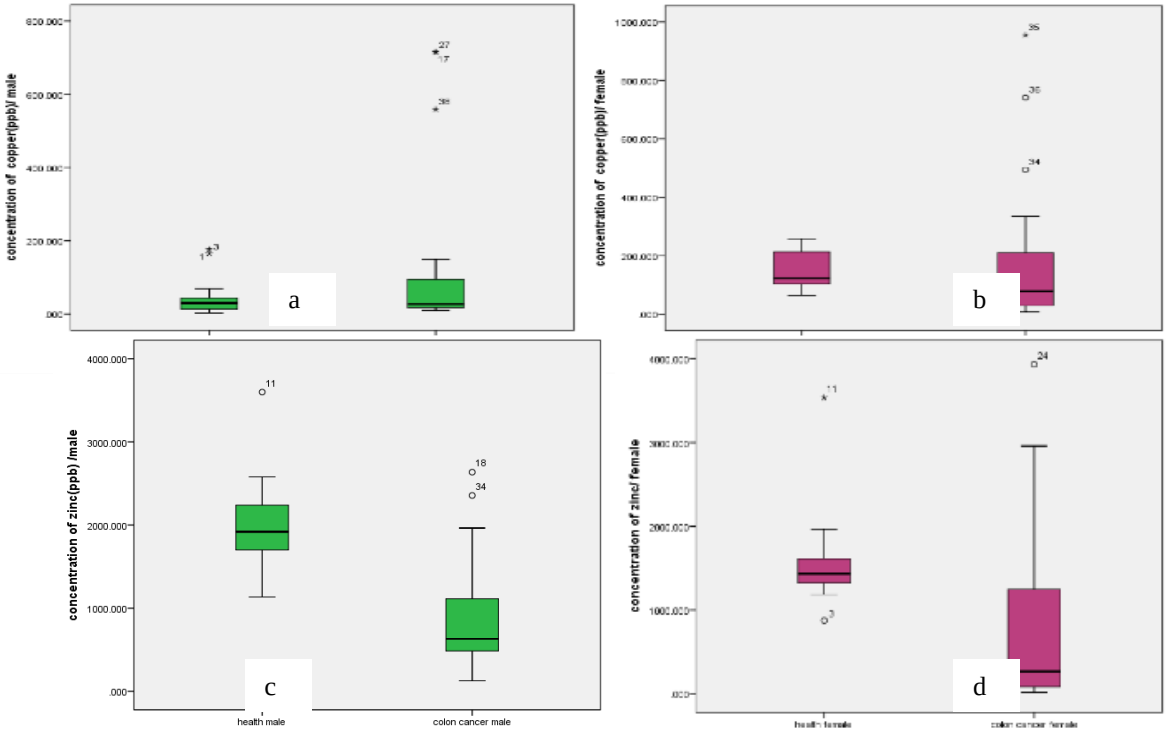

Figure 3. Comparison of serum concentrations (ppb) of Cu(a. male ,b. female) and Zn(c .male ,d . female) between healthy and colon cancer groups

Table 2
Characteristics of studies between serum of concentration level of Cu and Zn in colon cancer patients and health group

	Groups	mean± St.Dev.		References
		Cu	Zn	
1.	Patients(µg/dl) Healthy(µg/dl)	2.82 ± 0.58 5.58 ± 1.57	0.13 ± 0.02 3.17 ± 0.74	[26]
2.	Patients(µg/dl) Healthy(µg/dl)	171.60±22.50 93.36±6.86	85.02±14.94 97.86±10.61	[27]
3.	Patients(µg/mL) Healthy(µg/mL)	1.31 ± 0.20 1.15 ± 0.20	1.14±0.28) 1.13±0.17	[28]
4.	Patients(µg/dl) Healthy(µg/dl)	55.50±2.48 80.11±3.21	101.23±5.32 98.97±4.78	[29]
5.	Patients(µg/dl)	137.5 ± 122.38	81.04 ± 52.05	[30]

	Healthy(µg/dl)	160.68 ± 45.12	141.64 ± 51.75	
6.	Patients(µg/dl) Healthy(µg/dl)	83.9± 15.61 101.4± 15.69	77.44 ± 8.09 94.6 ± 15.35	[31]
7.	Patients(µg/dl) Healthy (µg/dl)	154.60 ± 91.71 152.08 ± 12.56	65.39 ± 61.01 117.14± 63.27	[32]

Table 3
Compare the correlation factor between the studied items

Variables	Correlations	Cu H.M.	Cu H.F.	Cu colon M.	Cu colon F.	Zn H.M.	Zn H.F.	Zn colon M.	Zn Colon F.
Cu health male	*Pearson c.*	1							
	P- value								
Cu female health	*Pearson c.*	-0.298-	1						
	P- value	0.282							
Cu male colon cancer	*Pearson c.*	-0.050-	-0.059-	1					
	P- value	0.860	0.834						
Cu female colon cancer	*Pearson c.*	0.255	-0.478-	-0.239-	1				
	P- value	0.360	0.071	0.272					
Zn mal health	*Pearson c.*	0.041	0.063	0.165	-0.007-	1			
	P- value	0.883	0.825	0.558	0.981				
Zn female health	*Pearson c.*	-0.444-	0.457	0.008	-0.219-	0.675**	1		
	P- value	0.098	0.087	0.978	0.433	0.006			
Zn male colon cancer	*Pearson c.*	-0.041-	-0.158-	-0.089-	0.287	-0.174-	-0.131-	1	
	P- value	0.883	0.575	0.688	0.184	0.535	0.643		
Zn Female colon cancer	*Pearson c.*	-0.338-	-0.306-	-0.190-	0.298	-0.423-	-0.042-	0.035	1
	P - value	0.218	0.267	0.386	0.157	0.116	0.882	0.874	

**. Correlation is significant at the 0.01 level (2-tailed)

From the above table to study the Pearson factor between the concentrations of the two studied elements, copper and zinc for the two groups of healthy people and colon cancer patients for males and females, it was found that the relationship between the two studied groups is negligible and has no statistical significance, except for zinc in healthy males with females was positive and direct with statically significant, which important for future studies.

Conclusion

Copper levels were not significant between the two groups of healthy males and females, but were higher in colon patients compared to healthy controls, while the average concentration of zinc in the blood serum in the group of healthy males and females was higher than the average concentration. In highly statistically

significant coli patients, the concentrations of the two components of zinc in healthy males with positive and direct females were statistically significant, which is important for future studies.

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