

The Study of trace elements (Zinc and Selenium) among Iraqi patients with liver cancer

Nadia Abdulateef *¹ and Abdulameer J. Mohammed²

Middle Technical University – College of health & medical Technology /
Baghdad - Iraq

E-mail (*): nadiaabd17@yahoo.com

Abstract

Background: Trace elements are defined as dietary minerals which are present in minute quantities (<0.01 %) of the organism mass. They are important for normal growth, development, maintenance and recovery of the human body health, it is classified as macro minerals up 60 to 80 percent material of the organism. Those elements are Ca, P, Mg, Na, K, Cl – and S. Those elements are necessary in amounts of more than 100 mg per day. Whereas the (microminerals) are needed in amounts of less than 100 mg per day. Zinc is one of the highly significant of trace elements in the body human is Zinc, its importance is noticed in developing central nervous system. Zinc deficiency furthers cancer by inhibiting normal vitamin A and DNA repair and lipid metabolism. Zinc is an plays important roles in cellular metabolism. Selenium(Se) was as an element of the glutathione peroxidase enzyme which, combined with vitamin E, superoxide dismutase and catalase, represents a component of one of the body's anti-oxidant defense systems. This study aimed to identify the study of trace elements (Zinc and Selenium) among Iraqi patients with liver cancer.

Subject and Methods: This is a cross section study was conducted at three main medicals.

facilities in Baghdad: The Main Training Center for Tumors/Oncology Teaching Hospital, Poisoning Consultation Center and Ministry of Science & Technology

during the period from November/2019 to February/2020 to identify the estimation of the serum levels of zinc and selenium, the information regarding the study was obtained according to questioner (gender, age, liver disease, drug uses, and alcohol were recorded) .

Results: Both groups were matching. All patients with primary liver cancer and metastasis. Serum levels of zinc (72.24 ± 7.50 mg/dl vs 70.89 ± 7.27 , $p < 0.01$) and selenium (52.65 ± 14.27 mg/dl vs 49.11 ± 13.37 , $p < 0.01$) were significantly lower among patients with HCC compared to normal subject.

Conclusions: Lower serum levels of zinc and selenium can be associated with a higher risk of liver cancer development.

Keywords: Zinc, Selenium, Liver cancer.

دراسة العناصر النزرة (الزنك و السيلينيوم) بين مرضى سرطان الكبد في العراق

طالبة ماجستير نادية عبد اللطيف¹ و أ.م.د. عبد الامير جاسم محمد²

الخلاصة

الخلفية: تُعرّف العناصر النزرة على أنها معادن غذائية توجد بكميات ضئيلة جدًا ($<0.01\%$) من كتلة الكائن الحي. إنها مهمة للنمو الطبيعي ، والتطور ، والمحافظة على صحة الجسم البشري ؛ تصنف على أنها معادن كبيرة تصل إلى 60 إلى 80 في المائة من مادة الكائن الحي. هذه العناصر هي Ca و P و Mg و Na و K و Cl و S. هذه العناصر ضرورية بكميات تزيد عن 100 مجم في اليوم. في حين أن المعادن الدقيقة مطلوبة بكميات أقل من 100 مجم في اليوم. يعتبر الزنك من العناصر الهامة للغاية في جسم الإنسان ، وتلاحظ أهميته في تطوير الجهاز العصبي المركزي. يزيد نقص الزنك من السرطان عن طريق تثبيط ترميم فيتامين أ والحمض النووي الطبيعي واستقلاب الدهون. يلعب الزنك أدوارًا مهمة في التمثيل الغذائي الخلوي. كان السيلينيوم (Se) كعنصر من عناصر إنزيم الجلوتاثيون بيروكسيداز الذي يمزج مع فيتامين E ، وأكسيد الفائق ديسموتاز والكتلاز ، ويمثل أحد مكونات أنظمة الدفاع المضادة للأكسدة في الجسم.

الكلمات المفتاحية : الزنك ؛ السيلينيوم ؛ سرطان الكبد .

Introduction

Zinc is one of the highly significant of trace elements in the body human is zinc, its importance is noticed in developing central nervous system. Zinc regulate the operation of the glutamic acid decarboxylase that can be defined as a rate limiting en enzyme in synthesis of gamma aminobutyric acid, which can be abbreviated to (GABA), also it helps with the calcium inhibitory impact on N-methyl-d-aspartate receptors and it does high the affinity of neurotransmitters such as glutamate to their receptors [1].

Zinc is important role in protein synthesis makes it essential for normal complement production. Zinc deficiency furthers cancer by inhibiting normal vitamin A and DNA repair and lipid metabolism. Zinc is an plays important roles in cellular metabolism. Zinc is essential in all forms of life. [2]. The liver mainly plays important role in maintaining systemic zinc homeostasis. Zinc deficiency causes plenty of metabolic abnormalities, including hepatic steatosis, hepatic encephalopathy, iron overload and insulin resistance [3].

In mammals, Selenium (Se) was as an element of the glutathione peroxidase enzyme which, combined with vitamin E, superoxide dismutase and catalase, represents a component of one of the body's anti-oxidant defense systems. Burk and his colleagues have made considerable steps towards purifying and characterizing ‘’ selenoprotein-P’’ but until now, they were not capable of clarifying its function in the human beings [4]. Selenium salts are toxic, but trace amounts are very important for cellular function in a wide range of organisms, and that involved all animals. The amount of selenium in the human body is ranging between 13-20 mg. Mushrooms, fish, meat, nuts, eggs and cereals are the main source of dietary selenium, Brazilian nuts are considered the highest dietary source of selenium. [5]. Activating antioxidant defense techniques and oxidative damage are caused when the selenium level low significantly in children with simple febrile

seizures. Decreased levels of serum Se in patients with SFS could prompt FS or could participate to its recurrence. [6].

Subjects and Methods

Between November/2019 to February/2020. A total of 150 cases have participated in this research and were divided to 2 groups. The first one included 100 patient (male and female) aged between 25-83 years, this group was patient with liver cancer. The second group included 50 healthy that have normal liver organ and without any previous history of any systemic diseases. A detailed background data including patient history of liver cancer, medical and physical examination was done on all studied groups with the assistance of a physician in oncology teaching hospital. Each patient filled a questionnaire case sheet.

Determination of zinc

The following concentration of the working standard (0.0, 50, 100, 150, 200) $\mu\text{g/dl}$ of zinc were made for calibration. Serum (0.5) ml was taken from thawed sample, dispensed in to a clean 10 ml centrifuge tube and diluted to 5 ml with deionized water (1:10). The diluted serum was mixed well and directly aspirated into the flame. Zinc was measured at wavelength 213.9 nm by flame atomic absorption spectrophotometry.

Determination of selenium

Sample preparation is taken 50 μ of serum mixed with nitric acid (HNO_3) then measurement was done using graphite furnace atomic absorption spectrophotometry, working standard of (0.0, 0.5, 1.0, 1.5) $\mu\text{g/dl}$ was used to plot a standard curve. Serum of 20 μl was injected in to the graphite tube and three readings were taken for each sample and the mean value of these reading was registered. Selenium was measured at wavelength 196 nm by Graphite Furnace

Atomic Absorption Spectrophotometry and value was obtained from the working standard curve.

Results and discussion

Liver cancer is the sixth most commonly diagnosed cancer [7]. Cancer incidence among Iraqi people is relatively high and tendency of it are up going in interval of quantity and variables concerning to age, sex, etc. Management and prevention of cancer are still inadequate. [8] The result in present study showed 55.46 ± 14.15 years aged for primary liver cancer and 51.36 ± 13.50 years for metastasis liver cancer (table 1).

Table (1): Mean \pm Std. values of Age (year) of Study Groups

Study Groups	N	Mean \pm Std.
Healthy Control	50	32.65 ± 11.89
Primary liver cancer	37	55.46 ± 14.15
Metastasis	63	51.36 ± 13.50

The result of present study represent the comparison of Zinc ($\mu\text{g/dl}$) among study groups. The highest Mean \pm Std. was among healthy control group (102.96 ± 21.12) ($\mu\text{g/dl}$) of Zinc compared to the Primary liver cancer group (72.24 ± 7.50) ($\mu\text{g/dl}$) showed highly significant difference. ($P < 0.01$ HS), also with Metastasis group (70.89 ± 7.27) ($\mu\text{g/dl}$) the comparison was highly significant difference ($P < 0.01$ HS). (table 2). while table (3) showed the distribution of Zinc ($\mu\text{g/dl}$) levels according to Study Groups. The higher percentage among metastasis group (87.3%) was abnormal of Zinc level ($\mu\text{g/dl}$), followed by primary liver cancer group was (78.3%), while was lower among healthy control group. The results showed decrease in the level of zinc in comparision to the healthy individual the results agree with results of the study conected by Atsushi Hiraoka et.at (2020) [9].

Table (2): The Comparison of Zinc ($\mu\text{g/dl}$) among study groups

Study Groups	N	Mean \pm Std.	t-test	P-Value	C.S.
Healthy Control	50	102.96 \pm 21.12			
Primary liver cancer	37	72.24 \pm 7.50	8.444	.000	P< 0.01 (HS)
Metastasis	63	70.89 \pm 7.27	11.316	.000	P< 0.01 (HS)

Table (3): The distribution of Zinc ($\mu\text{g/dl}$) levels according to Study Groups

	Primary liver cancer		Metastasis		Healthy Control	
	No.	%	No.	%	No.	%
Normal	8	21.6	8	12.7	45	90
Abnormal	29	78.3	55	87.3	5	10
Total	37	100%	63	100%	50	100%

Table (4) represent the comparison of Selenium (ppb) among study groups. The highest Mean \pm Std. was among healthy control group (145.24 \pm 47.73) (ppb) of Selenium compared to the Primary liver cancer group (52.65 \pm 14.27) (ppb) showed highly significant difference (P< 0.01HS), also with Metastasis group (49.11 \pm 13.37) (ppb) the compare was highly significant difference (P<0.01HS), while table (5) Showed the distribution of Selenium (ppb) according to Study group.

The highest percentage of abnormal Selenium (ppb) level was (95.2%) of metastasis group, followed by (94.6%) of primary liver cancer group while healthy control group had normal Selenium (ppb) level. the results agree with the result of [Ziwei Zhang](#) (2016) [10].

Table (4): Comparison of Selenium (ppb) among study groups

Study Groups	N	Mean \pm Std.	t-test	P-Value	C.S.
Healthy Control	50	145.24 \pm 47.73			
Primary liver cancer	37	52.65 \pm 14.27	11.413	.000	P< 0.01 (HS)
Metastasis	63	49.11 \pm 13.37	15.264	.000	P< 0.01 (HS)

Table (5): The distribution of Selenium (ppb) levels according to Study Groups

	Primary liver cancer		Metastasis		Healthy Control	
	No.	%	No.	%	No.	%
Normal	2	5.4	3	4.8	50	100.0
Abnormal	35	94.6	60	95.2	0	0.0
Total	37	100%	63	100%	50	100%

In conclusion; it is important to know that the concentration of trace elements zinc and selenium decreases with the progression of liver cancer, and increasing the proportion of these elements in the diet can lead to the failure of the disease.

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