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Physical study of Nickel Serum Level in blood samples from Iraqi populations

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ABSTRACT

Trace elements examining of basic biological components in the human and animal body, is essential due to the increase and the decrease in them may lead to toxicity. In this study, 32 patients who were diagnosed with lung cancer in 32 healthy volunteers were compared. Serum level concentrations of Fe trace elements were measured using Atomic Absorption Spectrometry. There was statistical significance difference in nickel serum levels when comparing the mean of healthy with patient concentration, where the value of P (0.05 > p) was found. The level of serum components in the patient may be important in causing lung cancer.

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دراسة فيزيائية لمستوى النيكل في عينات مصل الدم لدى السكان العراقيين

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الـــخُـــلاصـــة

عناصر الاثر هي المكونات البيولوجية الأساسية في جسم الإنسان والحيوان ، أي ان الزيادة والنقصان فيها تسبب الكثير من الضرر مثل السمية. في هذه الدراسة ، تم مقارنة ٣٢ مريضا يعانون من سرطان الرئة الذين تم تشخيصهم مع ٣٢ متطوعا أصحاء. تم الحصول على تركيزات مستوى المصل للعناصر النزرة باستخدام مطياف الامتصاص الذري. حيث كانت هناك دلالة إحصائية لتركيز النيكل في مستويات المصل عند مقارنة متوسط الطبيعي مع تركيز المريض ، حيث كانت قيمة الاحتمالية اقل من ٠.٠٠٥ قد يكون مستوى النيكل يلعب دور مهم في امراض سرطان الرئة.

الكلمات المفتاحية:

سرطان الرئة
الامتصاص الذري
النيكل
L.C (عينـــات ســـرطان الرئـــة)
وN(عينات الاصحاء).

1. INTRODUCTION

Cancer consider the main reason of the most deaths among people worldwide, lung cancer accounts for 16%, according to the World Health Organization. which is the most common solid tumor diagnosed [1]. During the 11 years ago (2000-2010), the number of lung cancer in the population of Iraq (27599), (1050) (3.80%) of males and (26549) (96.20%) of females[1].

Several studies have shown that the mineral compounds of these elements act as an anti-estrogen activator, and further confirm the relationship between element compounds and the same elements that maybe causes risk of lung cancer where lead, cadmium and arsenic are a source of oxidative stress related to lung cancer[2,3,4]. Some trace minerals act as catalysts that increase the oxidative damage of biological molecules and DNA, which is also known to be carcinogenic and capable of producing toxic effects such as **(Reactive oxygen species**) ROS formation and [5].The main objective of this study is to try to find a relationship between cancers such as lung cancer, and the percentages of concentrations of influencing factors using an atomic absorption device and whether the association between increase or decrease its concentrations is taken into account in medical treatments to prevent cancer expansion as much as possible[6,7].

Trace Elements and Immunity

Previously it has been observed that there is a strong relationship between health and nutrition and that immunity is highly responsive to nutrients. The presence of the proportions of the elements to suit the needs of the body is a key factor of nutrition that protects humans and animals from infection [8]. In the current study, we try to find what happens if there is a defect in the trace elements and how that will effects the blood cells and body organs such as tissues and bones marrow, lymph nodes and whether the concentration of these elements that have a relationship with immune cells [9].

Nickel

Nickel is a rather common element, representing 0.018% of the earth's crust, compared to 0.0015% lead. Nickel compounds are known carcinogens in both human and animal models. There is evidence that the genotoxic effects of nickel compounds may be indirect through the inhibition of DNA repair systems[1]. An uptake of too large quantities of nickel has the following consequences:

a) Higher chances of development of lung cancer, nose cancer, larynx cancer and prostate cancer.

b) Sickness and dizziness after exposure to nickel gas.

c) Lung embolism.

d) Respiratory failure.

e) Birth defects.

f) Asthma and chronic bronchitis.

g) Allergic reactions such as skin rashes, mainly from jewellery.

h) Heart disorders [10]. patients with liver cancer and another a group without liver cancer, the nickel deposits reported to be clearly more common in the group with liver cancer[11.12].

Materials and Methods

In order to achieve this study, first step blood samples were taken from human of ages (24-84) years. This work carried out at the middle Euphrates (cancer) center, Al Najaf city, Iraq also control samples were collected from Al Sader general hospital at al-Najaf al-Ashraf Governorate , which consist of two stages:

- Blood samples were taken from donors in the hospital from vein and categorized for examination.

- The collected blood samples were labeled, and kept in clean and hygiene places for examination by atomic absorption spectroscopy.

Five milliliters of blood were collected for each patient and the sample was placed in clean and dry test tube without any anti-coagulant which kept for 45 minutes at room temperature (22 ± 2℃) for the formation of clot. Serum of patients were separated by centrifuge at 1500 r.p.m. up to 15 minutes and were collected in screw capped test tubes. AShimadzu model AA-670 Flame Atomic Absorption Spectrophotometer (FAAS) was used for the determination of Fe concentration with wavelengths equal (328.1, 217.0and 228.8) nm respectively, and its widths of is (0.5,1, and 0.5) nm respectively where was the flame fuel is acetylene that supported by air.

Sample digestion

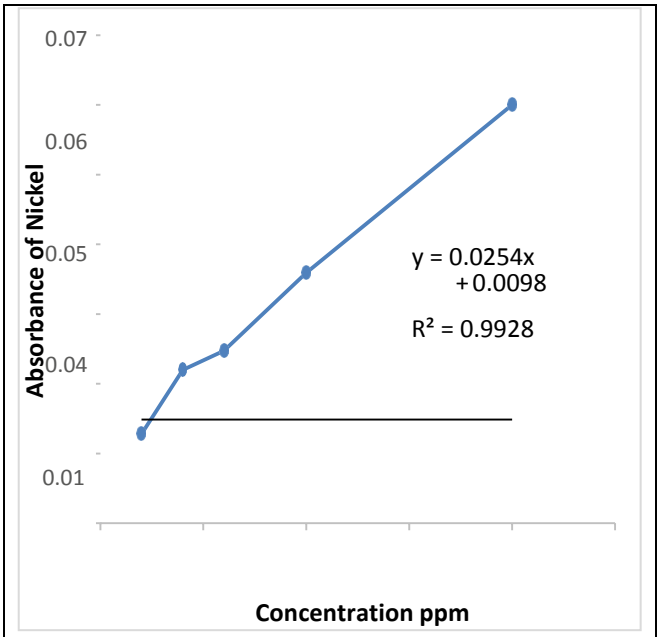
The 0.001 liters of serum were placed in a glass beaker and 10 ml was added to the beaker as (1:1) $HClO_4$ / HNO_3 acid mixture. The mixture was transferred to a 25 ml vial that was pre-cleaned, then diluted with double distilled water and stored for analysis later by atomic absorption [6, 7].

Calibration

these compounds, less melting in the watery medium appear to be the most carcinogenic substances. The involvement of carbonyl Ni [carbon dioxide] in lung and sinus cancer in industrial workers is implicated as a potential carcinogen in tobacco smoke.

Ni deficiency is a major risk factor for lung cancer. And its value (R2) was 0.9928 in figure (1). The results of our study clearly show the difference in concentration of serum control and lung cancer patients. This significantly reduced level ($p > 0.05$) of this component was also agreed with other studies, while the Levine test was found to be significant (P=0.05).

that is significant difference ($p < 0.05$)The results were so similar to those published in other literatures .while that found the Levene's Test is significant p = 0.05.



Figure(1): Calibration curve of Ni in aqueous solution

Statistical Analysis

The SPSS the statistical program (SPSS for Windows version 20, SPSS Inc., Chicago, Illinois, USA), was used, the results were computed the mean and standard deviation were compared with the lowest and highest value. Std. Mean Error, Levine's Test and P-value that can be considered as a statistical function when the value of ($p < 0.05$) while if ($P > 0.05$) statistically there are non-significant all relation for all results as shown in Table 1.

Results and Discussion

Thirty-two samples were collected from lung cancer patients and compared with thirty healthy controls, the mean age are (24 -84) years and (86 -22) year respectively and Ni element concentrations were measured for patients and health .The results were statically compared for patients and healthy samples as shown in table below:

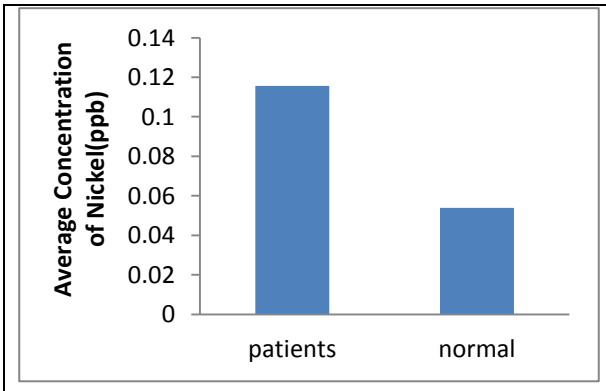
Table (1): Serum traces elements concentration (Ni) in patients of lung cancer and control subjects

Sq.	Code	Age(year)	Concentrations(ppm)of Ni in health human (N).	Code	Age(year)	Concentrations(ppm) of Ni in lung cancer (L.C)
1.	N1	84	0.0453	T1	85	0.0893
2.	N2	80	0.044	T2	82	0.096
3.	N3	70	0.068	T3	81	0.084
4.	N4	65	0.0533	T4	80	0.0827
5.	N5	60	0.0987	T5	78	0.0800
6.	N6	52	0.0507	T6	76	0.0933
7.	N7	50	0.0480	T7	75	0.1427
8.	N8	48	0.0613	T8	73	0.0733
9.	N9	40	0.0653	T9	72	0.0907
10.	N10	45	0.0733	T10	70	0.0840
11.	N11	37	0.0440	T11	68	0.0840
12.	N12	35	0.0227	T12	67	0.0827
13.	N13	31	0.0400	T13	66	0.1053
14.	N14	30	0.0360	T14	65	0.1280
15.	N15	28	0.0560	T15	64	0.1280
16.	N16	25	0.0467	T16	63	0.100
17.	N17	24	0.0373	T17	62	0.1080
18.	N18	23	0.0427	T18	61	0.1053
19.	N19	22	0.0427	T19	60	0.1187
20.	N20	20	0.0347	T20	59	0.1093
21.	N21	46	0.0453	T21	58	0.1427
22.	N22	43	0.0653	T22	52	0.1573
23.	N23	41	0.0467	T23	51	0.132
24.	N24	39	0.1267	T24	50	0.1413
25.	N25	34	0.0427	T25	44	0.1333
26.	N26	32	0.0387	T26	42	0.1480
27.	N27	29	0.0693	T27	41	0.1320
28.	N28	27	0.0413	T28	39	0.1360

29.	N29	26	0.0613	T29	24	0.1600
30	N30	21	0.0387	T30	23	0.1467
31	N31	40	0.0827	T31	50	0.1360
32	N32	35	0.0533	T32	30	0.1480
average			0.053834			0.115581

Table(2) :Comparison between the patient and control groups for(Ni) as trace elements

Element	Group	Upper limit	Lower limit	Mean± SD	P-value	Std. Error Mean	Levana's Test	Sig.
Fe	Patients	72.2757	12.7809	.115581 ±.0265	0.0	0.004	8.491	0.005
	Control	40.4479	13.4293	.053834 ±.0204		0.004		



Figure(2): Comparative of concentrations mean values between trace element for health and patient of lung cancer(Nickel Means & Samples)in axis.

We noted the concentration of nickel in patients higher than control as compared with another published research [13]. Since the value of P-value is smallerr than 0.05, it is not statistically significant. Therefore, we found statistical significance for serum concentrations of nickel and for lung cancer patients that are compared with healthy human.

Conclusions

1- The present study were highlights the role of nickel in the emergence of lung cancer.

2- Identified the concentration of metal ions in the blood and can be utilize as pre-indicator for cancer, including lung cancer.

3-The concentration of nickel element in patient samples is higher than its concentration in healthy control samples.

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