

Evaluation of Copper and Zinc in Sera of Iraqi Male Patients with Prostate Cancer in Baghdad City

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Abstract

Prostate cancer is an important and potentially fatal disease in humans. Both genetic and environmental risk factors are associated with increased risk of prostate cancer among Asian populations. Previous observations have shown that heavy metals play various roles in human health. The heavy metals such as copper and zinc are known to be associated with prostate cancer, but their functions are unclear.

The aim of the present work was to study serum trace elements such as Cu and Zn in Iraqi male patients with prostate cancer.

A total of 25 prostate cancer patients was participated in this study from the Al-Kadhimia Teaching Hospital; their age range was (40–65) years and 25 healthy men matched in age as a control group during the period from February 2015 until the August 2015 after the diagnosis using a histopathological examination of the malignant tumor, the blood was centrifuged and serum samples resultant were separated and stored until the assay time.

There was a significant increase in serum copper in prostate cancer patients as compared to the control, ($P=0.001$) while serum levels of zinc showed no significant differences, ($P=0.42$). However, there was an elevation in serum zinc levels in prostate cancer patients as compared to the control, but it was not statistically significant. The copper/zinc ratio was increased in prostate cancer patients as compared to the control, but it was not significant, ($P=0.42$).

This study had shown a significant increase in copper value, no significant difference in zinc value, and higher copper/zinc ratio in malignant prostate. The Cu/Zn ratio was found to be a better indicator of grade of prostate cancer.

Key Words: Prostate cancer, traces elements, copper/zinc ratio.

Introduction

Prostate carcinoma is a public health problem that is currently the most frequent neoplasm and the second leading reason of cancer-related deaths in males of western populations^(1,2).

Frequent risk factors for prostate cancer have been documented. Age, race, and family history of prostate cancer are identified risk factors for this tumor; however, there are a lot of probable risk factors for prostate cancer⁽³⁾.

Copper (Cu) and zinc (Zn) are heavy metals and are recurrently detected in the environment. Various studies have shown that metals are connected with adverse health, possessions, pointing to their importance as a public health concern⁽⁴⁾. These factors participate in a vital role in the development and progression of tumor cells, either by performing frankly, in a causative pathway or indirectly, by performing on genes related disease susceptibility. These recommend indirect mechanisms include regulation of hormone level or regulation of carcinogenic agent's metabolism⁽⁵⁾.

Insufficiency of trace elements as enzyme cofactors is probable to expose the individual to carcinogenic stress⁽⁶⁾. These trace metal form center structures of superoxide dismutase (SOD) which are a group of metallic enzymes that catalyze the disproportionate of superoxide free radical ($O_2^{\cdot-}$) to form hydrogen peroxide and dioxide, hence breaking down the toxic reactive oxygen species (ROS) radical⁽⁷⁾.

Copper is an important element broadly distributed in nature. Increased serum and tumor tissue levels of Cu are also observed in several cancers, although little is known about how the metal might promote disease progression at the molecular level. Epidemiological studies have instituted no distinct association between Cu exposure and cancer⁽⁸⁾.

Zinc (Zn) is a necessary metal. Zinc toxicity is infrequent and occurs only at very elevated exposure levels. Oral Zn supplements do not appear to have significant effects on the incidence of cancer. Actually, Zn deficiency may be connected with increased risk of cancer in humans⁽⁹⁾.

Zinc, on the other hand, present in more than 200 enzymes and transcription factors as a functional component. Therefore, zinc affects major metabolic processes, as well as instruction of the cell cycle and cell division. The primary symptom of Zn deficiency is an inhibition of cell growth and proliferation. Additionally, Zn is required for the optimum performance of the immune system⁽¹⁰⁾.

The aspire of the present work was to study serum trace elements such as Cu and Zn in Iraqi male patients with prostate cancer.

Patients and Methods

A total of 25 prostate cancer patients was participating in this study from the Al-Kadhimia Teaching Hospital; their age range was (40–65) years and 25 healthy men age matched during the period from February 2015 until the August 2015 after the diagnosis using a histopathological examination of the malignant tumor, the blood was centrifuged and serum samples resultant were separated and stored until the assay time.

Determination of Serum Copper and Zinc:

Serums Cu, Zn was determined by atomic absorption spectrophotometry using Ward et al., method⁽¹¹⁾.

Statistical Analysis

The statistical analysis was completed using SPSS software and Microsoft Excel 2010. Data were expressed as means \pm SD. The means of Cu and Zn were

compared using t-test between the patients and the controls. P value at <0.05 was used to be significant.

Results

The results of this study are presents in table 1. Level of Cu was increased in patients viewing a highly significant distinction, (P=0.001) in prostate cancer patients as compared to the control. Serum levels of Zn showed no significant differences, (P=0.42). Nevertheless, there was an elevation in serum Zn levels in prostate cancer patients as compared to the control, although it was not statistically significant.

The copper/zinc (Cu/Zn) ratio was increased in prostate cancer patients as compared to the control, but it was not significant, (P=0.42).

Table1: Biochemical Parameters between the patients and the control group (means±SD)

Parameters	Patients	Control	P-Value
Cu (µg/dl)	165.0 ± 0.36	78.0±0.24	0.001
Zn (µg/dl)	65.0± 5.20	60.97±4.80	0.42 NS
Cu/Zn ratio	2.55±0.08	1.27±0.02	0.42 NS

NS: not significant.

Discussion

In this study, there was a significant increase in the Cu and no significant distinction in Zn among prostate cancer patient as compared with the control group. The elevation in serum Cu concentration may be due to the destruction and necrosis of involved tissues, leading to the release of Cu into circulation⁽¹²⁾. The segregation in copper determination methods may be the cause for these contradictory results.

Recently, it has been postulated that blood serum concentrations of Cu was significantly higher in patients with prostate cancer than in the controls, serum concentrations of Zn did not differ significantly in prostate cancer patients and controls⁽¹³⁾.

The present results are practically parallel to other findings reported by Ozmen et al. who was found a significant increase in serum Cu levels in prostate cancer patients compared with the controls⁽¹⁴⁾. Also, Nayak reported that serum Cu levels were increased significantly in cancer patients compared with the control group⁽¹⁵⁾.

The current study found that serum Zn levels in prostate cancer patients did not significantly be different with those in the controls. Nevertheless, the means concentrations of Zn were higher in prostate cancer patients than in the controls. A recent case-control study in the US found no association between serum Zn levels and prostate tumor. Park et al., analyzed serum Zn concentrations in 392 prostate cancer cases and 783 control matched in age, race/ethnicity, and fasting status. The means of serum Zn concentrations between the cases and the controls did not be different significantly⁽¹⁶⁾.

Some studies, however, found conflicting results. For instance, a study conducted by Ozmen in Turkey, found that Zn values were significantly lower in patients with prostate cancer than in the controls. A variation in the method of zinc recognition may be the cause for the differences between the results of the current study and earlier studies.

Regarding the role of minerals and heavy metals in the origination or advancement of prostate cancer, emerges one potential conclude that the raised levels of trace elements and heavy metals could have led to the formation of free radicals or additional reactive oxygen species that unfavorably manipulate DNA, thus causing prostate tumor. It is a hypothetical human prostatic carcinogen and has been shown to stimulate prostatic tumors and proliferative lesions in rats⁽¹⁷⁾. Copper/Zinc ratio has been considered in the circumstance of several chronic progressive diseases and high ratio predicted mortality in cancer patients in more than one prospective studies around 3.5 to 18 years^(18, 19).

Conclusions:

This study had shown a significant increase in Cu value, no significant distinction in Zn value, and high Cu/ Zn ratio in malignant prostate. The Cu/ Zn ratio was establish to be better indicator of grade of prostate cancer. It is recommended to employ trace elements and the Cu/ Zn ratio as biomarkers for prostate cancer disease and its progression.

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تقييم النحاس والخراسين في مصل الرجال العراقيين المصابين بسرطان البروستات في

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الخلاصة:

سرطان البروستات هو مرض خطير وقاتل للإنسان. ترتبط كلا عوامل الخطر الجينية والبيئية مع زيادة خطر الإصابة بسرطان البروستات بين سكان آسيا. وقد أظهرت الملاحظات السابقة ان المعادن الثقيلة تلعب أدواراً مختلفة في صحة الإنسان. من المعروف أن المعادن الثقيلة كالنحاس والخراسين تترافق مع سرطان البروستات، ولكن وظائفها غير واضحة.

كان الهدف من هذا البحث دراسة العناصر النزرة كالنحاس والخراسين لدى الرجال العراقيين المصابين بسرطان البروستات.

شارك في هذه الدراسة ما مجموعه ٢٥ من مرضى سرطان البروستات من مستشفى الكاظمية التعليمي. وكان معدل أعمارهم بين (٤٠-٦٥) سنة و ٢٥ رجلاً من الأصحاء بأعمار مقاربة خلال الفترة من شباط ٢٠١٥ ولغاية اب ٢٠١٥ بعد التشخيص باستخدام الفحص النسيجي المرضي للورم الخبيث، وتم فصل الدم بالطرد المركزي لدم وفصل عينات المصل الناتجة و خزنها لحين وقت الفحص.

كانت هناك زيادة كبيرة في النحاس في دم مرضى سرطان البروستات مقارنة مع مجموعة السيطرة، ($P = 0.001$) بينما أظهرت مستويات الخراسين في المصل عدم جود فروق ذات دلالة معنوية، ($P = 0.42$). ومع ذلك، كان هناك ارتفاع في مستويات الخراسين في مصل مرضى سرطان البروستات مقارنة مع مجموعة السيطرة، ولكن لم يكن ارتفاعاً معنوياً. هنالك ارتفاع في نسبة النحاس/ الخراسين لدى مرضى سرطان البروستات مقارنة مع مجموعة السيطرة، ولكنه لم يكن معنوياً، ($P = 0.42$).

أظهرت هذه الدراسة زيادة كبيرة في قيمة النحاس، في حين لا يوجد فرق كبير في قيمة الخراسين، وارتفاع نسبة النحاس/ الخراسين في سرطان البروستات. تم التوصل إلى أن نسبة النحاس/ الخراسين تعد مؤشراً أفضل على درجة الإصابة بسرطان البروستات.

كلمات مفتاحية: سرطان البروستات، العناصر النزرة، ونسبة النحاس/ الخراسين.