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Research Article

Comparing the Levels of Some Trace Elements with Liver Enzymes in Chronic Renal Failure Patients with Viral Hepatitis B and or C.

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ABSTRACT
The object of this work was to assess the association amongst copper, zinc and iron in contrast with liver enzymes (ALT, AST and ALP) level in chronic renal failure patients with hepatitis B or C. Serum samples were obtained from 90 patients with chronic renal failure (CRF) submission to hemodialysis (HD) at the hemodialysis unit in AL kindy hospital, Baghdad, Iraq in 2019. The ninety patients who enrolled in this study were; 30 patients with hepatitis B virus, 30 patients with hepatitis C infection and 30 patients devoid of hepatitis virus. The concentration of zinc, copper and iron were resolute by means of atomic absorption spectrophotometer (AAS), liver enzymes determined with an autoanalyzer system. A significant correlation was found between means of Cu in CRF patients with hepatitis C and AST in CRF patients without hepatitis with p_ value < 0.05 and Cu with AST in CRF with hepatitis B. Also a significant correlation was found between means of Zn and AST in both groups of hepatitis patients with chronic renal failure, between Zn and ALP in chronic renal failure patients without hepatitis, p_ value < 0.05, According to Zn means there was a highly significant correlation in CRF patients without hepatitis with those who had hepatitis C virus p_ value 0.003.

Keywords: Zinc; Copper; Iron; Viral Hepatitis; Liver Enzymes

INTRODUCTION

Many evidences point toward that trace elements had an essential roles in a numerous of biological processes. Trace elements acts by triggering or stopping enzyme responses, opposing with further elements and metalloproteines for required situates for attachment, distressing the penetrability of cell sheaths as well as employ improving effects that taking place in development of a number of illnesses (Goldhaber SB.,2003). In accordance with the requirements of the body, minerals can be classified into two parts, one large elements (the main elements) and the other small metals (trace elements). Large metals are defined as essential metals in quantities greater than 100 milligram / deciliter. The main minerals consist of magnesium, potassium, phosphorus, calcium, sodium and chloride. Whereas trace elements are those components that are inorganic in the body and are considered vital with fewer than 100 milligram / deciliter. Trace elements consist of iron, manganese, zinc, selenium, iodine, copper, molybdenum, cobalt and fluorine (Fraker and King.,2004). There are three classes of trace elements: (Class I) those elements that are necessary for human health (manganese, iron, copper, zinc, chromium, selenium, molybdenum and iodine). (Class II) This is useful but not critical (namely, boron, fluorine, lithium and vanadium). (Class III) These are not constructive and are mainly linked with toxic effects (comprising lithium, lead, cadmium, aluminum, and lithium) (O'Connor JM.,2001) Iron is the best important TE. (AL-Jebour.,2016)Iron deficiency or iron metabolic disorders lead to a number of human diseases. Zinc is second only to the greatest plentiful iron in the body, where there are 1.4-2.3 grams in the body of 70 kilogram. Tissues and fluids particularly rich in zinc are the liver, prostate, semen, retina, hippocampal kidneys, muscles and bones. It has great importance in protein production and has a vital function in gene expression; together the role of enzymatic and structural. Copper is an important TE and is linked with a numerous of metalloproteins, the chief roles of copper metalloproteins comprise oxidation-reduction reactions (AL-Jebour.,2016). Hepatitis can be definite as a medicinal situation that described by the infection of the liver through the animation of the responding cells in this body part, this illness may advance to fibrosis or self healing (Fadhil.,2011). Liver enzymes are frequently used in the valuation of patients who have variety of sicknesses. Typically they are provide an info if a patient's primary sickness is hepatitic origin or cholestatic source (Hall and Cash.,2012). Alanine Aminotransferase (ALT): It is an enzyme that stimulates the relocation of amino-group of alanine to α-ketoglutarate, subsequent in the construction of pyruvate and glutamate(Harvy

and Ferreir.,2007). The enzyme was previously termed serum glutamic pyruvate transaminase (SGPT) (Thapa and Walia.,2011). Aspartate Aminotransferase (AST): The AST transfer amino-groups from glutamate to oxaloacetate, creating aspartate(Harvy and Ferreir.,2007).The enzyme was in the past called serum glutamic oxaloacetic transaminase (SGOT) (Thapa and Walia.,2011) Alkaline phosphatase: Alkaline phosphatase (ALP) is an enzyme that carrying metabolites through the cell sheaths(Ali.,2008) . In the liver, ALP is initiate histochemically in the microvilli of bile canaliculi and on the sinusoidal external of hepatocyte((Thapa and Walia.,2011)), furthermore it possibly will be initiate from further tissues, for example the intestines, placenta, kidneys or from leukocytes(Ali.,2008) . The current research aims to study the association among copper, zinc and iron in contrast with liver enzymes (ALT, AST and ALP) level in chronic renal failure patients with hepatitis B or C.

MATERIAL AND METHODS

In this work, blood samples was collected from 90 patients with chronic renal failure undergoing hemodialysis (HD) at the hemodialysis unit. The Determination of AST, ALT, ALP concentration in serum done with an autoanalyzer system (Abbott Architect c4000). Serum zinc, copper and iron were resolute by means of atomic absorption spectrophotometer. The statistical analysis was obtained using the statistical package for Social Science (SPSS) version (18) and Microsoft Excel (2010) software's. Descriptive Statistics for all data of each set were expressed as mean ±SD. The $P<0.05$ was considered statistically significant.

RESULTS AND DISCUSSION

Copper and zinc had a significant roles in degeneration of the liver wherever Cu doings as a cofactor against hepatic fibrosis, predominantly in the biosynthesis of collagen(Rashed.,2011).

In this work (Table 2), low concentrations of Zn were found in all groups, this was agreed with Al-Jebouri., 2016 AL-Shaki.,2011 who described that mean serum Zn level in hepatitis patients was lesser from healthy individuals. Hypozyncemia progresses in cases of progressive hepatic destruction and severe hepatitis (Ali and Kader., 2011). Once the malady changes from chronic hepatitis to hepatic cirrhosis, serum phosphorus, calcium, zinc and magnesium concentrations drop, whereas the copper concentration rises. Those trace element irregularities possibly will reproduce such pathological situations like cholestasis, liver dysfunction, hepatic fibrosis or hepatic redevelopment. Pramoolsinsap et al. serum zinc levels were significantly declined in patients with chronic active hepatitis, hepatocellular carcinoma, and cirrhosis (Ali and Kader., 2011), With the progress of the liver impairment, reduced appetite, weakened work of intestines and stomach and rise blood pressure, zinc consumption besides absorption drops and correspondingly the little content of serum albumin outcomes toward fewer joining with zinc and for the reason that the dissemination characteristic of blood zinc, it is simply missing via sweat plus urine (Yasuyuki et al.,2004).

Also low concentrations of Cu were found in all groups in our study (Table 2), AL. Mazaal and Mussa.,2007 indicates that serum Cu and Zn levels are poorer in patients with CRF undergoing HD than in controls, as they mentioned some investigators attributed that little levels of Zn and Cu to protein – calories malnutrition which recurrently changes in patients because of dietary limitation. Loss of appetite and reduced absorption by the intestinocytes may furthermore be causative factors. In addition to the above, a third probable cause for low serum Zn and Cu levels in these patients may be extreme loss of trace elements into the dialysate. Furthermore low of serum Zn levels could be due to a specific Zn transport fault, and lack of an intestinal Zn ligand. Cu and Zn supplementations have been suggested when protein is limited in CRF patients (AL. Mazaal and Mussa.,2007).

Ali .,2011 stated that Kalkan et al showed significant higher levels of Cu in patients with viral hepatitis. Salih et al .,2005 measured the changes in serum Cu and Zn in patients with chronic hepatitis, they found unaffected serum zinc and copper concentrations in patients with chronic hepatitis C. Regularly, the content of Zn rather than Cu in the blood plasma falls with sickness development. Original explanations declared blood plasma concentration of Cu, Fe, Pb and Zn may perhaps be an indication of the significance and complexity of the declared maladies (Brasiskiene et al.,2011).

Rendering to concentration of Fe was within the normal range in all groups. This was granted with QASSIME et al .,2013 who mentioned that no significant difference among hepatitis patients and controls in serum Fe level this is perhaps for the reason that an accumulation of iron in liver parenchyma. While Loguercio et al. stated that cirrhotic patients had a substantial fall of serum Fe and Zn level (SOMI et al.,2007).

A significant association was found between means of Cu in CRF patients with hepatitis C and AST in CRF patients devoid of hepatitis with p_ value < 0.05 and Cu with AST in CRF with hepatitis B (Table 3). This is might be trace elements can alter some enzymes activity (Wu et al., 2010; Reddy et al.,2009). Gomes et al., displayed that trace elements are involved in

pathogenesis of hepatitis C infection (Saghir et al., 2011; Gomez et al2010). Abediankenarl et al., 2011 presented that no significant alteration was found in mean copper values among the groups. Also a major correlation was found between means of Zn and AST in both groups of hepatitis patients with chronic renal failure, between Zn and ALP in chronic renal failure patients devoid of hepatitis, p_ value < 0.05, Abediankenarl et al., 2011 showed that they find a significant correlation between means of Zn and AST with p_ value < 0.05 in patients with hepatitis C and patients with viral C cirrhosis. This metal is absorbed by way of the small intestine and passed to the liver and happen as a part of enzymes (like, alkaline phosphatase comprises zinc) and participate in diverse metabolic responses (Abediankenarl et al., 2011).

According to Zn means there was a highly significant correlation in CRF patients without hepatitis with those who had hepatitis C virus p_ value 0.003 (Table 3). The alteration of that metallic concentrations in blood plasma may perhaps be a mark or a probable cause for the presence of hepatitis C and cirrhosis indicators (Brasiskiene et al.,2011).

Table 1: Means and stander errors of Liver Enzymes among groups:

Enzymes		Mean	Std.error ±
ALT	HCV+	38.000	8.6692
	HBV+	29.000	4.2869
	Hve-	38.000	8.6692
AST	HCV+	87.600	19.7525
	HBV+	29.300	4.5192
	Hve-	32.400	4.0939
ALP	HCV+	278.500	50.3632
	HBV+	80.550	10.4074
	Hve-	162.500	27.7478

the concentration unit of liver enzymes is U/L; Hve-: patients without hepatitis virus; HCV+: patients with hepatitis C virus; HBV+: patients with hepatitis B virus

Table 2: Means and stander errors of Trace Elements among groups:

Elements		Mean	Std.error ±
Cu	HCV+	1.239	.0296
	HBV+	1.371	.0518
	Hve-	1.360	.0462
Zn	HCV+	0.775	.0467
	HBV+	0.742	.0223
	Hve-	0.674	.0174
Fe	HCV+	1.155	.0574
	HBV+	1.219	.0346
	Hve-	1.033	.0510

the concentration unit for trace elements is ppm

Table 3: Relationship between liver enzymes and trace elements among groups:

Elements		Value	Enzymes	Value	Correlation confession (r)	P-value
Cu	HCV+	1.239	AST (Hve-)	32.400	0.733*	0.016
	HBV+	1.371	AST (HBV+)	29.300	0.675*	0.032
Zn	HCV+	0.775	AST (HBV+)	29.300	0.636*	0.048
	Hve-	1.033	ALP (Hve-)	162.500	0.752*	0.012
Zn	HCV+	0.775	Zn (Hve-)	0.674	0. 825**	0.003

* Correlation is significant at the 0.05 level (2-tailed).

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

CONCLUSION

There was a highly significant correlation in CRF patients devoid of hepatitis with individuals who had hepatitis C virus according to Zn means, a significant correlation between means of Cu in CRF patients with hepatitis C virus and AST means in CRF patients with no hepatitis, also in CRF patients with hepatitis B virus a significant correlation between means of Cu and AST. A significant correlation between means of ALP and Zn CRF patients lacking hepatitis and between Zn and AST between the two groups of hepatitis patients with CRF.

REFERENCES

1. Ali N. (2008). Molecular screening of hepatitis C virus in anti-HCV negative blood donors.Ph.D.thesis, Baqai Medical University, Karachi.
2. Ali NM, Kader SI.(2011).Serum levels of copper, zinc, iron and magnesium in Iraqis patients with chronic hepatitis C. Karbala J. Med. Vol. 4, No.3-4.
3. Abediankenarl S, et al.(2011). Determination of Trace Elements in Patients with Chronic Hepatitis B. Acta Medica Iranica; 49(10): 667-669.
4. Al-Jebouri A H.(2016). Evaluation of Liver Function Tests in Patients Viral Hepatitis in Baghdad City. PhD. thesis, Medicine College/Tikrit University.
5. AL. Mazaal A J. and Mussa Y A.(2007). The Evaluation of serum Zinc, Copper, Sodium and Potassium levels in hemodialysis patients. QMJ VOL. 2 No.3.
6. AL-Shaki MK.(2011). Determination the level of some trace elements in sera of Iraqis patients with viral hepatitis B infection. Diyala journal for pure sciences. Vol. 7, No.2.
7. Brasiskiene S, et al.(2011). Correlation of metal ions and liver enzymes in blood plasma. chemija. vol. 22. No. 4. P. 223–228.
8. Fadhil R. S.(2011). Complication of HBV, HCV and HIV infections in patients with Coolyze anemia& Chronic Myeloid Leukemia in Baghdad. M Sc. Thesis. COLLEGE OF HEALTH AND MEDICAL TECHNOLOGY /2 Foundation of Technical Education.
9. Fraker PJ, King LE. (2004). Reprogramming of the immune system during zinc deficiency. Annu Rev Nutr 24: 277-298.
10. Goldhaber SB. (2003). Trace element risk assessment: essentiality vs. toxicity. Regul Toxicol Pharmacol 38: 232-242.
11. Gomez EV, Perez YM, Sanchez HV, Forment GR, Soler EA, Bertot LC, Garcia AY, del Rosario Abreu Vazquez M, Fabian LG.(2010). Antioxidant and immunomodulatory effects of Viusid in patients with chronic hepatitis C. World J Gastroenterol (21):2638-47.
12. Hall Ph, Cash J.(2012). What is the real function of the liver (Function) tests?. Ulster Med J . (811):30-60.
13. Harvy RA, Ferreir DR.(2011). Lippincotts Illustrated Reviews: Biochemistry. 5th ed. China: Wolters Kluwer/ Lippincott Williams& Wilkins; 251.
14. O'Connor JM. (2001). Trace elements and DNA damage. Biochem Soc Trans 29: 354-357.
15. QASSIME MM. et al. (2013). STUDY THE CLINICAL RELATIONSHIP BETWEEN CHRONIC HEPATITIS B AND SERUM TRACE ELEMENT LEVELS. Al-Kufa University Journal for Biology. Vol: 5 Issue: 1 Pages: 304-310.
16. Rashed MN.(2011). The role of trace elements on hepatitis virus infections: A reviewJournal of Trace Elements in Medicine and Biology ;181–187.
17. Saghir M, Shaheen N, Shah MH. (2011) .Comparative evaluation of trace metals in the blood of hepatitis C patients and healthy donors. Biol Trace Elem Res 2011;143(2):751-63.
18. Salih Cesura, Sevsen Altınay Cebecib, Guzin Ozelci Kavasb, Neziha Yılmazc, Demet Iren Buyukkagnicib.(2005). Serum copper and zinc concentrations in patients with chronic hepatitis C. Journal of Infection, 51, 35–37.
19. SOMI, M.H., A. OSTAD RAHIMI, B. MOSHREFI, P. REZAEIFAR, G.J. MAGHAMI.(2007). Nutritional status and blood trace elements in cirrhotic patients, Hepatitis Monthly, 7(1), 27–32.
20. Reddy KP, Sailaja G, Krishnaiah C. (2009). Protective effects of selenium on fluoride induced alterations in certain enzymes in brain of mice. J Environ Biol 30(5 Suppl):859-64.
21. Thapa BR, Walia A. (2007) Liver function tests and their interpretation. Indian J Pedi . 74: 663-671
22. Wu M, Kang MM, Schoene NW, Cheng WH.(2010). Selenium compounds activate early barriers of tumorigenesis. J Biol Chem;285(16):12055-62.
23. YASUYUKI, A., M. MISUHIKO, A. YASUO. (2004). Liver cirrhosis and metabolism (sugar,zprotein, fat and trace elements), Hepatol. Res., 30, 46–5.