

Study of the impact of some liver enzymes (GOT, GPT, ALP) for the employees at the Tuwaitha nuclear site.

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Abstract

Background: Al Tuwaitha is the center of radiation activity in Iraq and which includes several directorates that have radioactivity such as radioactive waste removal and storage of radioactive sources as well as contain a reactor and a hot cell. In this study, the level of some liver enzymes was determined as the liver is the largest organ in the body and more sensitive to radiation for employees in different site in Tuwaitha and comparison the level of these enzymes with the level of liver enzymes to other people from outside Tuwaitha (as control) that do not contain radioactive activity.

The aim: this study aims to determine the effects of radiation on the level of liver enzymes and to investigate the health of employees.

Method: The level of enzymes was measured by kinetic method using the ready kit (French agappe) and the work all done in the laboratories of the radioisotopes department for the period from 2/1 to 30/5 of 2017. The blood samples were taken from a number of employees at different site in Al-Tuwaitha and a number outside the Tuwaitha site. The control group was compared to the employees. The groups ranged in age from (35 - 55 years) and their weight between (70 - 95 kg). The results were statistically analyzed using spss (version 20).

Results: The results were compared to the mean between two groups it showed no significant differences ($p > 0.05$) for the three enzymes between two groups.

Conclusion: Regularly evaluates the exposed doses of each employee along with the necessary health assessments. Normal values of concentration liver enzymes/ (GOT, GPT, ALP) and may ensure a good hepatic health of the radiation-exposed employees.

Keywords: livers enzymes, (GPT, GOT, ALP), nuclear site.

دراسة تأثير بعض أنزيمات الكبد للعاملين في موقع التويثة النووي

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الخلفية العلمية: ان التويثة هي مركز النشاط الإشعاعي في العراق والذي يشمل عدة مديريات لديها نشاط إشعاعي مثل إزالة النفايات المشعة وتخزين المصادر المشعة وكذلك تحتوي على المفاعل والخلية الحارة . في هذه الدراسة ، تم تحديد مستوى بعض انزيمات الكبد وهو أكبر عضو في الجسم وأكثر حساسية للإشعاع للعاملين في مواقع مختلفة من التويثة ومقارنة مستوى هذه الانزيمات مع مستوى انزيمات الكبد للأخرين من مواقع مختلفة خارج التويثة التي لا تحتوي على نشاط إشعاعي.

الهدف : تهدف هذه الدراسة إلى تحديد اثار الإشعاع علي مستوى انزيمات الكبد والتحقيق في صحة العاملين.

طريقة العمل : تم قياس مستوى الانزيمات بالطريقة الحركية باستخدام غدة جاهزة (غدة فرنسية) وتم العمل في مختبرات قسم النظائر المشعة للفترة من 1/2 إلى 5/30 من 2017 . وكانت العينات المستخدمة هي عينات دم مأخوذة من عدد من العاملين في مواقع مختلفة في التويثة وعدد اخر من خارج موقع التويثة التي لا تحتوي على نشاط اشعاعي . تمت مقارنة مجموعة السيطرة للعاملين . وتراوحت المجموعات في العمر من (35 - 55 سنة) وأوزنها بين (70 - 95 كيلو غرام) . تم تحليل النتائج إحصائياً باستخدام (spss) اصدار 20.

النتائج : قورنت النتائج للمجموعتين (المتوسط الحسابي) . ولم تظهر النتائج فروق معنوية (p > 0.05) بالنسبة للانزيمات الثلاثة للمجموعتين .

الاستنتاج : من الضروري تنظيم التعرض لجرع الاشعاع لكل عامل وهذا التنظيم ضروري لصحتهم . ان القيم الطبيعية لأنزيمات الكبد تضمن صحة جيدة للعامل المتعرض للإشعاع .

الكلمات المفتاحية : انزيمات الكبد , (GOT,GPT,ALP) , الموقع النووي

Introduction

Al-Tuwaitha nuclear research center is the largest, most complex and most radiological contaminated site in Iraq. Located about 20 km to the south of Baghdad, the Center has separate and distinct nuclear facilities which were destroyed during the Gulf Wars 1991. Radioactive material onsite has an increased potential to be dispersed and contaminate the environments.^{1,2,3}

The principal nuclear site is Al Tuwaitha nuclear research center which contains about 18 facilities, including research reactors, hot cells, waste treatment and storage facilities. Al Tuwaitha site considered as unique case most of its facilities suffer substantial physical damage during the Gulf Wars 2003. Despite the long history of nuclear programs at Al Tuwaitha.^{1,2,3}

Liver

The **liver** is the largest organ in humans, it is located in the upper right quadrant of the abdomen⁴ the liver has a wide range of functions, including **excretory function:**

bile pigments, bile salts and cholesterol are excreted in bile into intestine⁵.

Metabolic function: liver actively participates in carbohydrate, lipid, protein, mineral and vitamin metabolisms⁶.

Hematological function: liver is also produces clotting factors like factor V, VII. Fibrinogen involved in blood coagulation is also synthesized in liver. It synthesizes plasma proteins and destruction of erythrocytes⁷.

Storage functions: glycogen, vitamins A, D and B12, and trace element iron are stored in liver⁸.

Protective functions and detoxification synthetic function of liver.

The liver is considered a radiosensitive organ and therefore there is a need to look into the hepatic function for those employees who are exposed to radiation the current study is focused on the following liver

Levels of the enzymes are very useful in following up the progress of liver diseases⁹.

Perhaps the most commonly used indicators of liver (hepatocellular) damage are (GPT) and (GOT), formerly referred to as the SGPT and

SGOT. These are enzymes normally found in liver cells that leak out of these cells and make their way to the blood when liver cells are injured. The GPT is felt to be a more specific indicator of liver inflammation as GOT is also found in other organs such as the heart and skeletal muscle¹⁰.

The alkaline phosphatase is the most frequently used test to detect obstruction in the biliary system found both in the liver and bile, and leaks into the bloodstream in a manner similar to that described for the GPT and GOT, ALP is also found in other organs such as bone, placenta, and intestine¹⁰.

Abbreviation:

GPT glutamate pyruvate transaminase, GOT glutamate oxaloacetic transaminase, ALP alkaline phosphatase, SPSS statistical package social sciences, ALARA as low as reasonable achievable.

Employees and method

The present study was carried out on 50 employee from various site as (pathological) work has been done in the Radioisotope section labs for the period 2/1 – 30/5 of 2017. And 50 other person from various other site as (control) with age range between (35-55 years) and their weight range between (70-90 kg). blood samples were collected and placed in non-heparinized tubes, centrifuged at 3000 rpm for 10 minutes, sera after separation were then taken and used for measuring total, (GOT) 46U/L, (GPT) 49U/L, (ALP) normal range (80-306 U/L),. All the assays were performed based on the standard operating procedures using kit supplied by (agappe /France)¹¹

Statically analysis

All data have been presented as mean± standard deviation (independent-samples T-test) performed on each variable to compare the mean values from different groups differences were considered no significant at (**P>0.05**). All statistical analysis were performed at using spss .

Results and discussion

This study suggests that the liver might be damaged with radiation

dose series of changes, including injury to different organs, causing changes in the structure and function of cellular components, and resulting in tissue damage and death¹². The liver enzyme **GPT** rearranges the building blocks of proteins. The **GPT** concentration non-significant when compared between the two groups Figure (1)

The **GOT** concentration non-significant when compared between two groups Figure (2)

The **ALP** concentration non-significant when compared between two groups figure (3). **ALP** is processed in the liver and excreted into the digestive tract in the bile. A higher **ALP** levels than normal indicates liver problems¹³.

The serum **GPT** and **GOT** levels are common markers for hepatic toxicity; levels of these proteins were rapidly increased when the liver is damaged by any cause, including radiation, hepatitis or hepatic cirrhosis. Transaminases play an important role in protein and amino acid metabolism. They are found in the cells of almost all body tissues and when

diseases or injuries affected these tissues, they are released into blood stream¹³.

Some investigators have reported significant elevation in the activity of liver enzymes (**GPT** and **GOT**)¹⁴ But the results of present study not agreed with¹⁴. The reasons may be no direct exposure to radiation and there is a simple exposure treated by the liver. The commitment of the employees to the (**ALARA**) was good it mean we should employees

Time, distance and shielding to reduce our radiation dose typically that is the end of it and we move onto something else besides trying to ensure that occupational and public exposure to radiation is kept as low as reasonably achievable.

The present study **concludes** that regularly evaluates the exposed doses of each employee along with the necessary health assessments. Normal values of liver enzymes (**GOT, GPT, ALP**) and may ensure a good hepatic health of the radiation-exposed employees.

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Table (1) shows means and standard deviation for both two groups

Parameters	GPT	GOT	ALP
Patients	16.70 ± 7.41	14.32 ± 7.28	107.08 ± 27.45
Controls	15.0 ± 6.0	15.73 ± 4.84	104.50 ± 28.37
P value	0.1	0.1	0.9

Table-2- shows mean and standard deviation of age and body weight for both two groups.

Parameters	Patients	Controls	P value
Age (years)	44.70 ± 5.41	43.72 ± 5.84	NS
Body weight (Kg)	79.96 ± 7.4	93.1 ± 11.48	0.05

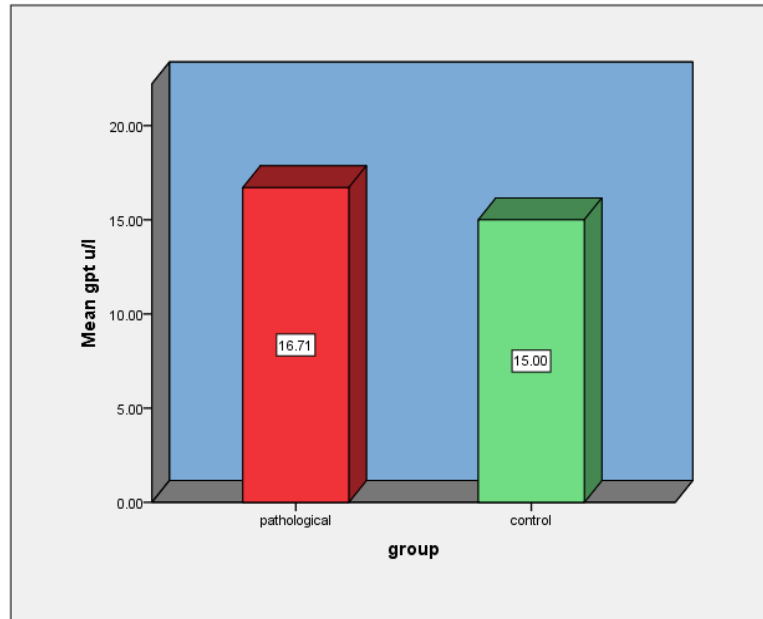


Figure (1) comparison of GPT between the two groups

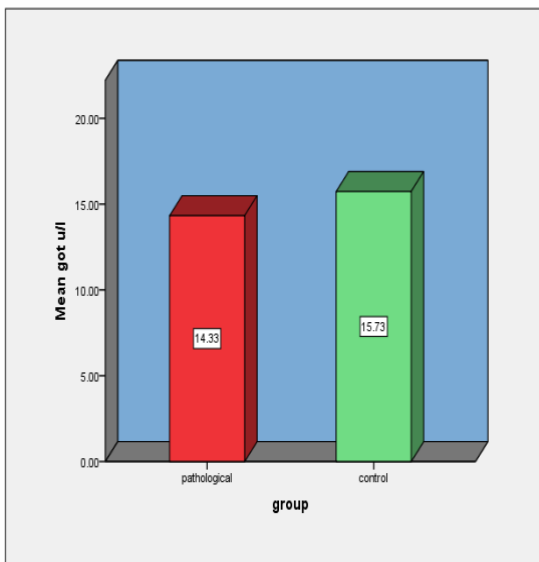


Figure (2) comparison of GOT between the two groups

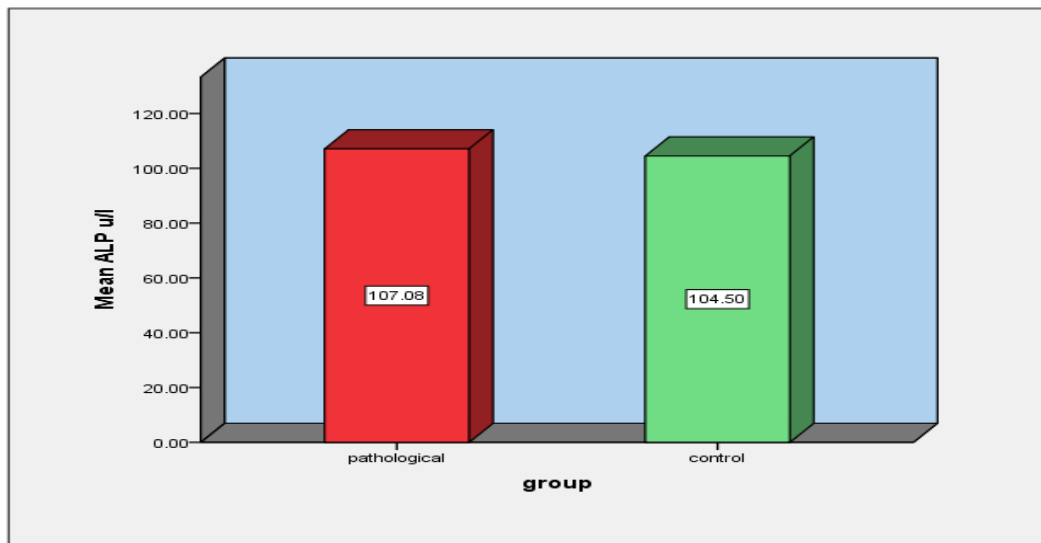


Figure (3) comparison of ALP between the two groups