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

Samira Aliwy Finteil; Ali Salih Jabbar; Qabas Ibrahim Abdul Majeed

samiraaliwy@gmail.com    ali0331975@gmail.com

*Directorate of Nuclear Research and applications in the Ministry of Science and Technology

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 تأثر بعض أنزيمات الكبد للعاملين في موقع التويثة النووي

سميرة عليوي فنطيل
علي صالح جبار                      قبس أبراهيم عبد المجيد

عنوان الباحثين/وزارة العلوم والتكنولوجيا /مديرية البحوث والتطبيقات النووية/قسم النظائر المشعة

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

الهدف: تهدف هذه الدراسة إلى تحديد أثر الإشعاع على مستوى أنزيمات الكبد وتحقيق صحة العاملين.

طريقة العمل: تم قياس مستوى الانزيمات بالطريقة الحركية باستخدام عينة جاهزة (عيدة فرنسية) وتم العمل في مختبرات قسم النظائر المشعة للفترة من 2/1 إلى 30/5 من 2017. وكانت العينات المستخدمة هي عينات دم مأخوذة من عدد من العاملين في مواقع مختلفة في التويثة وعدد آخر من خارج موقع التويثة التي لا تحتوي على نشط إشعاعي. تم تتقييم مجموعة السيطرة للعاملين. وتراوحت المجموعات في العمر من (35 - 55 سنة) وأوزنها بين (70 - 95 كيلوغرام). تم تحليل النتائج إحصائيا باستخدام (spss ) إصدار 20.

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

الاستنتاج: من الضروري تنظيم التعرض لجرع الإشعاع لكل عامل وهذا التنظيم ضروري لصحتهم. إن القيم الطبيعية للأنزيمات 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 disperse 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 intestine ⁵.

**Metabolic function**: liver actively participates in carbohydrate, lipid, protein, mineral and vitamin metabolisms ⁶.

**Hematological function**: liver is also produces clotting factors like factor V, VII. Fibrinogen involved in blood coagulation is also synthesized in liver. It synthesize plasma proteins and destruction of erythrocytes ⁷.

**Storage functions**: glycogen, vitamins A, D and B12, and trace element iron are stored in liver ⁸.

**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 diseases ⁹.

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 muscle\(^\text{10}\).

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 intestine\(^\text{10}\).

**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)\(^\text{11}\).

**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 death\textsuperscript{12}. The liver enzyme \textit{GPT} rearranges the building blocks of proteins. The \textit{GPT} concentration non-significant when compared between the two groups Figure (1)

The \textit{GOT} concentration non-significant when compared between two groups Figure (2)

The \textit{ALP} concentration non-significant when compared between two groups figure (3). \textit{ALP} is processed in the liver and excreted into the digestive tract in the bile. A higher \textit{ALP} levels than normal indicates liver problems\textsuperscript{13}.

The serum \textit{GPT} and \textit{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 stream\textsuperscript{13}.

Some investigators have reported significant elevation in the activity of liver enzymes (\textit{GPT} and \textit{GOT}) \textsuperscript{14} But the results of present study not agreed with \textsuperscript{14}. 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 (\textit{GOT}, \textit{GPT}, \textit{ALP}) and may ensure a good hepatic health of the radiation-exposed employees.
References


Tests. Schiff’s diseases of the liver, 8th edn. USA; JB Lippincott Publications, 1999; 205-239.


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

<table>
<thead>
<tr>
<th>Parameters</th>
<th>GPT</th>
<th>GOT</th>
<th>ALP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td>16.70 ±7.41</td>
<td>14.32± 7.28</td>
<td>107.08 ± 27.45</td>
</tr>
<tr>
<td>Controls</td>
<td>15.0 ± 6.0</td>
<td>15.73 ± 4.84</td>
<td>104.50 ± 28.37</td>
</tr>
<tr>
<td>P value</td>
<td>0.1</td>
<td>0.1</td>
<td>0.9</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Patients</th>
<th>Controls</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>44.70 ± 5.41</td>
<td>43.72± 5.84</td>
<td>NS</td>
</tr>
<tr>
<td>Body weight (Kg)</td>
<td>79.96 ± 7.4</td>
<td>93.1 ± 11.48</td>
<td>0.05</td>
</tr>
</tbody>
</table>
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