Evaluation of some Biochemical and Hematological parameters in Pulmonary Tuberculosis patient in Al-Qadisiyah Province

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and zinc

ABSTRACT
The experiment was designed to investigate the impact of tuberculosis in patients with the disease. This cross-sectional study was performed in Al-Qadisiyah province, Iraq. This examination was conducted with 60 males that age ranges from 25-55 years, which divided into 30 males with Tuberculosis disease and 30 voluntary healthy as a control group. Assay of study evaluation of parameters levels that include: Bodyweight Albumin, total protein, AST, ALT, urea and creatinine, ESR, Hb, and WBC count. Also, the study included Zn estimation by using solid-phase enzyme-linked immunosorbent assay. The results reported a significant (P<0.05) decreased in biochemical investigation in this study (Bodyweight, albumin, total protein, and ALT) while the hematological analysis showed substantial decreased in Hb but exhibited a significant (P<0.05) increases in ESR and WBC count in male's patients with Tuberculosis disease as compared with healthy groups. Although, the result showed significant (P<0.05) decreased in Zn level in a patient with Tuberculosis compared with control, While AST doesn't show significant (P<0.05) compared with control. Urea and Creatinine levels were significantly decreased in patients Tuberculosis disease compared with control healthy. The current study concluded that tuberculosis disease affected the liver and kidney by decreasing the protein and enzyme produced in the liver, and the kidney also causes a defect in hematological parameters in patients with the disease.

INTRODUCTION
Pulmonary tuberculosis is a common chronic and infectious bacterial disease that is caused by Mycobacterium Tuberculosis, which can affect various parts of the body (Dahle et al., 2001). It mainly affects the lungs, and this disease may kill about 2 million people annually, and is particularly sensitive to this disease those infected with HIV / AIDS, which they can transmit to individuals with a healthy immune system (Jong et al., 2009). In 1993, the World Health Organization (WHO) took an important step in declaring the global tuberculosis epidemic as a global emergency. However, if this disease not controlled, one billion people will be infected, 200 million patients and about 35 million will die with TB between the two years from 2000 to 2020 because of the emergence of new strains of drug-resistant tuberculosis (TB) (Narain et al., 1966). Malnutrition and wasting of the disease are also associated with HIV, and malnutrition and tuberculosis are a major problem in most of the world’s underdeveloped. Nutritional status is significantly lower in patients with active tuberculosis.
compared to healthy controls, malnutrition and protein deficiency as causes elevated the risk for effecting with tuberculosis (Kanda et al., 2015; Standaert et al., 1989)

Micronutrient deficiencies, such as zinc deficiency, lead to weakened immunity and thus increased sensitivity to infections such as tuberculosis (Karyadi et al., 2000; Lettow et al., 2004). Zinc in the body is involved in various activities, such as metabolic function, immunity, and wound healing (Dp, 1990). The main protein albumin for plasma has been reported as a decrease in tuberculosis (Onwubalili et al., 1988). Alanine Transaminase (ALT)) also called Pyruvic Transaminase Serum (SGPT) with a normal adult range of 7 - 56 IU / L, significantly increases in severe liver damage, such as viral hepatitis or paracetamol (acetaminophen) overdose. Aspartate transaminase (AST)) is also called serum glutamic oxalocetic transaminase (SGOT) is an enzyme associated with parenchymal liver cells mainly found in the liver, heart, kidneys, pancreas, and muscles. It is seen in tissue damage, especially heart and liver (WHO, 2012). The present study aimed to study the effect of TB patients on biochemical and hematological parameters in patients with the disease because the disease targets important organs in the body.

MATERIALS AND METHODS

Subject study design

The study was performed in Teaching Hospital in Al-Qadisiyah province, Iraq. Thirty male patients are divided into two study groups patient group included 30 subjects, and the healthy group was consisting of 30 healthy males. The ages of patients and healthy ranged 25-55 years old. The patient’s group was depended according to age and disease. Exclusion criterion in this study any patients with other diseases are excluded, and the male patients less than 25 or older than 55 years are also excluded.

Blood samples collection

The Blood samples were drawn from the vein by sterilized synergies with 5 ml. The sample put in two labeled tubes. The first group of tubes contains EDTA as anticoagulants to prevent clotting of blood from being used for Hematological studies. While the second group of tubes was without anti-coagulant as gel tubes for blood to be used for preparing serum for following biochemical parameters. Blood was left at room temperature for 10 minutes for clotting, centrifuged 6000 rpm for 10 minutes, and then serum was separated and freezing at -80 ºC until time for conducted the laboratory analysis for the study.

Biochemical parameters

Measurements of albumin and Total protein concentrations

These were done by a method based on the enzymatic colorimetric test, executed with the specific kit for a test, supplied by BIOLABO.

Measurements of AST and ALT concentrations

These were done by a method based on the enzymatic colorimetric test, executed with the specific kit for a test, supplied by BIOLABO.

Measurements of Urea and Creatinine concentrations

These were done by used of enzyme colorimetric kits (Randox Laboratories, Ltd, Admore’ Antrim, United Kingdom’)

Estimation of Human Zinc

The specific kit for measuring human zinc levels in serum was supplied by using the immune enzymatic technique Enzyme-Linked Immunosorbent Assay [ELISA].

Hematological analysis

The hematological parameters, including ESR, WBCs, and HB, was measured by using NSysmex –kx21 (Auto Blood Analyzer) in the Hematology Laboratory in Diwaniyah of Teaching Hospital.

Statistical analysis

Statistically, the analysis was conducted using the SPSS package (SPSS, Version 23) to analyze the data. T-test has been used to find the significant comparison between patients and control groups of Means and Standard Error with range. All these statistically analyzed at significant P< 0.05.

RESULTS AND DISCUSSION

Each group of studies can be recognized by biochemical and hematological diagnosis. As shown in the Table 1 the mean of biochemical investigation in this study which reported a significantly (P<0.05) decreased in (Bodyweight, albumin, total protein, and ALT) As in the Figures 1 and 2, While the table showed decrease in AST but not statistically significant in patients with pulmonary tuberculosis comparison to the healthy groups as inFigure 2. But the results of this table also indicated there is a significant decrease (P<0.05) in serum Zn in patients as compared to the healthy control, as in Figure 3.

As well as the Table 2 shows the hematological analysis of this study. The results of this table indicated
Table 1: Biochemical parameters in male patients with pulmonary tuberculosis

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control (n=30) (mean ± SD)</th>
<th>Case (n=30) (mean ± SD)</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bodyweight (kg)</td>
<td>80.32 ± 5.21</td>
<td>75.32 ± 4.66</td>
<td>sig*</td>
</tr>
<tr>
<td>Albumin (g/100ml)</td>
<td>4.28 ± 0.62</td>
<td>3.32 ± 0.05</td>
<td>sig*</td>
</tr>
<tr>
<td>Total protein (g/100ml)</td>
<td>8.13 ± 0.55</td>
<td>7.64 ± 1.05</td>
<td>sig*</td>
</tr>
<tr>
<td>AST U/L</td>
<td>27.45 ± 8.75</td>
<td>22.14 ± 2.15</td>
<td>Sig</td>
</tr>
<tr>
<td>ALT U/L</td>
<td>13.33 ± 4.35</td>
<td>9.55 ± 1.35</td>
<td>sig*</td>
</tr>
<tr>
<td>Urea (mg/dl)</td>
<td>3.21 ± 7.3</td>
<td>23.21 ± 6.9</td>
<td>sig*</td>
</tr>
<tr>
<td>Creatinine (mg/dl)</td>
<td>0.74 ± 0.16</td>
<td>0.45 ± 0.13</td>
<td>sig*</td>
</tr>
<tr>
<td>Serum zinc (µmol/L)</td>
<td>0.59 ± 0.25</td>
<td>0.47 ± 0.12</td>
<td>sig</td>
</tr>
</tbody>
</table>

Sig *(highly significant)

Figure 1: Some biochemical parameters of tuberculosis patients and control group

there is significant increase (p>0.05) in level of erythrocyte sedimentation rate (ESR) and the number of white blood cells (WBCs) count, while significant decrease (p<0.05) in hemoglobin (Hb) g/dl in patients as compared to the healthy control groups as in the Figure 4.

The results of the current study showed that the ages of patients with pulmonary tuberculosis ranged from 25-55 years, and this result agreed with the study of (Ekweani, 1989), who reports that most of the participants of the patient with tuberculosis had ages less than 50 years old. (Narain et al., 1966) where he pointed out that the age of 40 and below is more contact with the family and stay more periods than others to petition in the family to stay longer in the home and thus contact with the disease carriers as well as the degree of mobilization and cultural level of the family and this is consistent with (Standaert et al., 1989). Also, the results in a Table 1 and Figure 1 show this disease in the current study was causes decrease in normal weight of men as in the study of (Lettow et al., 2004) who observed that the declined in weight of the body was the most ethical factor for this patients. The statistical analysis of current results in a Table 1 and Figure 1 showed high significance (P<0.05) decreases in serum albumin and total protein levels in male patients with tuberculosis compared with healthy control group this acceptable with the results of (Pc, 1994). The possible causes of low plasma and albumin zinc in tuberculosis patients were considered to be nutritional factors, enteropathy, and acute-phase reactive proteins (Dp, 1990).

Tuberculosis also affects liver function as a result of
Table 2: Hematological parameters in male patients with pulmonary tuberculosis.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Control (n=30) (mean ± SD)</th>
<th>Case (n=30) (mean ± SD)</th>
<th>Significant</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESR (mm/h.r)</td>
<td>21.25±4.42</td>
<td>9.33±2.05</td>
<td>sig*</td>
</tr>
<tr>
<td>HB (g/L)</td>
<td>8.12±1.15</td>
<td>13.25±1.22</td>
<td>sig*</td>
</tr>
<tr>
<td>WBCs (%)</td>
<td>17.10±2.85</td>
<td>7.19±1.11</td>
<td>sig*</td>
</tr>
</tbody>
</table>

Sig * (highly significant)
its invasion and concentration in the liver in addition to its release of toxins in it, causing damage to the liver tissue, which leads to a decrease in liver function, which causes a lack of concentration of enzymes (AST, ALT) in the blood (Singh and Paterson, 1998). Weight loss may also occur as a side effect of previous symptoms or as a separate symptom because this infection may also appear in other parts of the body causing disruption of vital processes in the body leading to weight loss (Jacob et al., 2009).

Serum urea and creatinine levels significantly decreased in the tuberculosis group than the control group as in Table 1 and Figure 3, which could not be separated with an increase in the production of reactive oxygen species (ROS) in tuberculosis (Tirkey et al., 2005) (Onwubalili et al., 1988). Urea levels are chemical data. Essential vitality can be used to help diagnose and monitor drug reaction with kidney damage (Winston et al., 1999). A recent study, Serum urea, and creatinine levels were significantly (p>0.05) lower in tuberculosis patients compared to the healthy group. This finding is consistent with the study of (Folarani and , 2004). (Ugwuja, 2007) justify that increased urinary loss due to osmotic diuresis may make the common and often basic motivation of low electrolytes. But the study of (Johnkennedy et al., 2012) reported a significantly (p>0.05) increase in serum urea level compared to controls healthy. It is associated with the increased production of reactive oxygen species (TB) in tuberculosis. In both countries, the production of free radicals increases, affecting renal conditions. These free radicals, proteins, enzymes, and DNA can thus create some pathological disorders (Turki et al., 2005). In the imbalance between free radicals and antioxidants, electrolyte imbalance may occur in addition to a high urea level (Nwanjo et al., 2007).

The level of zinc plasma in Table 1 and Figure 3 observed among tuberculosis patients was significantly (p>0.05) lower than the controls, in agreement with a study in Indonesia (Pc, 1994), this was most likely due to the redistribution of zinc from plasma to other tissues, or the reduction of liver production of metallothionein, a protein that transports zinc to the liver (Gabay and Kushner, 1999). It also the low concentration of zinc leads to impair the body’s immune capacity, leading to increased sensitivity to infections such as tuberculosis (Karyadi et al., 2000; Lettow et al., 2004). Human zinc deficiency occurs at various stages of the disease and maybe a common factor in disease progression (Falutz et al., 1988), where zinc is involved in various activities, particularly metabolism, immunity and wound healing (Dp, 1990).

The Table 2 and Figure 4, the statistical analysis of current results indicated there is a significant increase (p>0.05) in ESR and WBC count while a significant decrease (p<0.05) in HB as compared to the healthy control groups. This was in agreement with (Standaert et al., 1989), who proposed that the decrease in Hb level. Study of (Holst et al., 2010) has been showed that the extremely high level of ESR
was found due to prolonged exposure to dust from industrial pollutants, chemicals and vapors from the exhaust vehicle and therefore frequent exposure to these pollutants increases respiratory problems and because large amounts of dust into the respiratory stream laden with bacterial and fungal spores increase respiratory infections. While the significant decrease in hemoglobin levels in patients is attributed to the fact that most antibiotics used to treat tuberculosis cause anorexia leading to malnutrition. So, malnutrition and low level of education are causes that have a pronounced effect of lowering Hb in the blood (Unsal, 2005), as reported by study that the decrease in hemoglobin level corresponds to age groups in tuberculosis patients attributed bad use of antibiotics as well as anemia. Based on the results in the present study, the number of white blood cells among infected patients was more than the healthy group.

**CONCLUSIONS**

This result may be due to the role of the immune system in resistance against pulmonary tuberculosis infection, and this result is in agreement which showed that there was a significant increase in the number of white blood cells in tuberculosis patients compared with the control group.

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**REFERENCES**


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