Plasma Proteins in Enterica Serovar Typhi Patients in Northern Sudan

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Abstract

Background: The study entailed a quantitative assessment of serum total protein, albumin, globulin, and albumin.

Method: globulin ratio in individuals who diagnosed positively with typhoid fever and detection any alteration in plasma protein in receptiveness to typhoid titers. One hundred positively diagnosed with typhoid infection mean age (41.5 ± 2.1) years on zero day treatments. In addition to healthy one hundred individuals mean age (42.9 ± 1.9) years were recruited in this study.

Results: There were significant difference P. value = 0.000 in total protein, serum albumin, serum globulin and A/G ratio for typhoid positive and negative, mean (8.4±0.01,6.8±0.06), (3.5±0.01, 4.1±0.03), (4.9±0.01, 2.8±0.06), (0.7 ± 0.003, 1.5 ± 0.02) respectively. No significant difference, P. value was 0.632, 0.832 and 0.760 serum total protein (7.5 ± 0.92, 7.6 ± 0.79) serum albumin (3.8 ± 0.38, 3.8 ± 0.37) and serum globulin (3.8 ± 0.16, 3.9 ± 0.16) for males and females respectively. Also no significant difference, P. value was 0.11, 0.60, and 0.06 serum total protein (8.4 ± 0.01, 8.4±0.02) serum albumin (3.5 ± 0.01, 3.5 ± 0.01) and serum globulin (5.0 ± 0.01, 4.9 ± 0.01) for titer 1/160 and titer 1/320.

Conclusion: Low albumin level and hypoglycemia should be surveillant when anti typhoid pharmaceutical commenced.

Key words: Plasma Proteins, Enterica Serovar Typhi, Sudan

Introduction

Typhoid fever caused by Salmonella enterica serovar Typhi is endemic in developing countries [1]. In industrialized countries, non-typhoid salmonella are a frequent cause of bacterial gastroenteritis and patients can be subjected to extra-intestinal complications [2,3]. It is potentially lethal and systemic infection and can lead to fetal if left untreated [4,5].
Typhoid fever causes high incidence of biochemical changes [6]. It causes significant decreases in serum albumin, while increases in total protein and globulin. These increments are consistent with humeral immune response and inflammatory conditions [6,7]. However, the low albumin concentration may suggest increased loss through renal tubules due to possible damage or disproportionate increase in globulin fraction of total protein. The total protein test measures the total amount of two kind of protein in the body. Albumin and globulin it is used as a part of the routine health checkup. It may also be used if you are experiencing unexpected weighed loss fatigue, or have symptoms of kidney or liver disease [8].

Salmonella enterica is a leading cause of community-acquired bloodstream infection in Africa. The contribution of typhoidal and non typhoidal Salmonella serovars to invasive disease varies considerably in place and time, even within the same country. Nonetheless, many African countries are now thought to experience typhoid fever incidence >100 per 100,000 per year with approximately 1% of patients dying (Crump and Heyderman.,2015). To the best of our knowledge there is lack of information regarding serum proteins profile in patients diagnosed positively with Typhoid fever in Merowe locality, northern Sudan. The study entailed a quantitative assessment of serum total protein, albumin, globulin, and albumin: globulin ratio in individuals who diagnosed positively with typhoid fever on zero day treatment compared to healthy ones, detection of any variations in estimated biochemical parameters between different genders in positive typhoid patients. In addition to, detect any alteration in plasma protein in receptiveness to typhoid titers.

**Key words**
Salmonella, Titre, alumin, globulin, sex

**Methods**
This is descriptive analytical case and control study. The study was done in El-Bar-Omdarag, Gelass, El-Brsa, Karema and Merowe (Merowe locality), northern Sudan. Data collection was collected in period between April to June 2014. Two hundred adult Sudanese individuals were volunteered to play a role in this study. One hundred positively diagnosed with typhoid infection (50 males and 50 females) with mean age (41.5 ± 2.1) on zero day treatments are the cases of this study. While, one hundred individuals (50 males and 50 females) with mean age (42.9 ± 1.9) negatively diagnosed with typhoid, apparently healthy as obtained by physical examination and disease history were defined as control in this study.

Five ml of venous blood was collected from each volunteer. Serum total proteins, Albumin were evaluated by using ELISA and Biosystems Company kits and under the instructions of the manufacturer. Globulin calculated by subtracting serum albumin from total protein. Serum globulin = total protein-Serum albumin (g/dl)

An informed consent, aims and benefits of this study were explained to the participants. Authors declare that there is no conflict of interest. The data was analyzed using Statistical Package for Social Sciences (SPSS), Windows version8x, 1997 SPSS, Inc, Chicago, IL, and USA.
Results

This study showed highly significant differences in all estimated biochemical parameters with mean ± S.D. (8.4±0.01, 6.8±0.06), (3.5±0.01, 4.1±0.03), (4.9±0.01, 2.8±0.06), (0.7 ± 0.003, 1.5 ± 0.02) for serum total protein, serum albumin, serum globulin and A/G ratio for typhoid positive and negative, respectively P. value = 0.000(Table 2). No significant difference, P. value was 0.632, 0.832 and 0.760 with mean ± S.D. serum total protein (7.5 ± 0.92, 7.6 ± 0.79) serum albumin (3.8 ± 0.38, 3.8 ± 0.37) and serum globulin (3.8 ± 0.16, 3.9 ± 0.16) for males and females respectively (Table 3). Also no significant difference, P. value was 0.11, 0.60, and 0.06 with mean ± SD serum total protein (8.4 ± 0.01, 8.4± 0.02) serum albumin (3.5 ± 0.01, 3.5 ± 0.01) and serum globulin (5.0 ± 0.01, 4.9 ± 0.01) for titer 1/160 and titer 1/320 (Table 4).

Table (1) Base line characteristic of study participants

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Typhoid positive</th>
<th>Typhoid negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male : Female</td>
<td>1 : 1</td>
<td>1 : 1</td>
</tr>
<tr>
<td>Mean age (years)</td>
<td>41.5 ± 2.1</td>
<td>42.2 ± 1.9</td>
</tr>
<tr>
<td>Titer of typhoid bacteria</td>
<td>1/160, 1/320</td>
<td>1/40, 1/80</td>
</tr>
</tbody>
</table>

Table (2) Comparison of estimated biochemical parameters between studied participants

<table>
<thead>
<tr>
<th>Variables</th>
<th>Typhoid positive Mean ± SD</th>
<th>Typhoid negative Mean ± SD</th>
<th>P. value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum total protein(mg/dl)</td>
<td>8.4 ±0.01</td>
<td>6.8 ±0.06</td>
<td>0.000</td>
</tr>
<tr>
<td>Serum albumin(mg/dl)</td>
<td>3.5 ±0.01</td>
<td>4.1± 0.03</td>
<td>0.000</td>
</tr>
<tr>
<td>Serum globulin(mg/dl)</td>
<td>4.9± 0.01</td>
<td>2.8 ±0.06</td>
<td>0.000</td>
</tr>
<tr>
<td>Albumin: globulin ratio</td>
<td>0.7</td>
<td>1.5</td>
<td>0.000</td>
</tr>
<tr>
<td>Glucose(mmol/L)</td>
<td>8.38 ± 0.07</td>
<td>17.56 ± 7.5</td>
<td>0.001</td>
</tr>
</tbody>
</table>

Table (3) Biochemical parameters between genders in Typhoid positive participants

<table>
<thead>
<tr>
<th>Variables</th>
<th>Male group Mean ± SD</th>
<th>Female group Mean ± SD</th>
<th>P. value</th>
</tr>
</thead>
</table>
Table (4) Comparison study of estimated parameters regarding typhoid titers

<table>
<thead>
<tr>
<th>Variables</th>
<th>Titer=1/160</th>
<th>Titer=1/320</th>
<th>P. value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serum total protein(mg/dl)</td>
<td>8.4± 0.01</td>
<td>8.4 ± 0.02</td>
<td>0.11</td>
</tr>
<tr>
<td>Serum albumin(mg/dl)</td>
<td>3.5± 0.01</td>
<td>3.5± 0.01</td>
<td>0.60</td>
</tr>
<tr>
<td>Serum globulin(mg/dl)</td>
<td>5.0 ± 0.01</td>
<td>4.9± 0.01</td>
<td>0.06</td>
</tr>
<tr>
<td>Glucose(mmol/L)</td>
<td>5.0±0.45</td>
<td>4.6±0.55</td>
<td>0.05</td>
</tr>
</tbody>
</table>

**Discussion**

Typhoid fever was significantly increased total serum protein and serum globulin while decreased serum albumin and albumin: globulin ratio in infected patients compared to healthy, irrespective to gender. This elevation of globulin is due to pathogen induced humeral immunity. Also low albumin level may amenable the pharmaceutical treatment and the prognosis of the disease. This in consistency with Bernardi , et al. [9]. serum globulin concentration was higher in typhoid patients as compared to that of normal individuals and Emenuga, et. al., (2014)& Reinoso , (1998) Due to inflammatory conditions Amen, et al., (2012) [6,7,10]. The increases in total protein and globulin were in agreement with previous reports and these are consistent with humeral immune response. However, the low albumin concentration may suggest increased loss through renal tubules due to possible damage. It is possible that it may be due to disproportionate increase in globulin fraction of total protein [10].

When comparing serum proteins between infected male and female this study showed no differences between the two genders. These indicate both sex responses in the same way to pathogen. Mean total serum proteins were significantly higher in female child as compared to male child. Mean serum albumin did differ
significantly between age and age x gender interaction; however, serum albumin concentration was low in young female as compared to that of young male. Serum albumin concentration was reported to be lower during infection and a study revealed there was no variation in serum protein in receptiveness to infection titer. Correlations between the titers and serum total protein, albumin and globulin were negatives; Glucose level was higher among typhoid negative; females have elevated level of glucose. While, increased typhoid titer showed low glucose level. Invasion of typhoid pathogen to small intestine induced inflammation that influence nutrients absorption efficiency so typhoid positive patients have low level of glucose consequently other nutrients. This study showed despite female did not differ from infected male in their response to pathogen but their physiological function differs as female glucose absorption didn’t affected as male did. So this indicated that female is more tolerant to pathogen induced intestinal inflammation. Lend supportive result Emenguna, et. al. (2014) ) blood glucose concentration was significantly lower in typhoid fever patients. This indicates compromised energy metabolism as a result of increased demand. This suggests that hypoglycaemia may be one of the biochemical complications of severe typhoid fever which may be considered in planning management regime [9-10].

**Conclusion**

Typhoid fever increased serum total protein and globulin while decreased albumin and albumin: globulin ratio, irrespective of genders. Typhoid positive females had higher serum glucose level compared to their counterpart males. Typhoid titers did not affect serum proteins concentrations.

**Recommendations**

Low albumin level and hypoglycemia should be surveillant when anti typhoid pharmaceutical commenced

**References**


