Seroprevalence of hepatitis B and C viruses among tuberculosis patients
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ABSTRACT
BACKGROUND: Tuberculosis is a common health problem in the world. Sudan is among the countries with the highest prevalence for tuberculosis and HBV, HCV infections. Co infection with viral hepatitis (HBV, HCV) among tuberculosis patients increases the risk of hepatotoxicity occurring during tuberculosis treatment, so it is important to know the seroprevalence of hepatitis B and C viruses among tuberculosis patients.

OBJECTIVES: To investigate seroprevalence of HBV and HCV among adult tuberculosis patients in tuberculosis center at Tropical Diseases Teaching Hospital (TDH).

METHODOLOGY: This is a prospective cross sectional study, conducted in the period from December 2010 to October 2011 in tuberculosis center in TDH- Sudan. 200 adult tuberculosis patients (age 19 years and above) were enrolled in this study, data were collected by using questionnaire. All patients' blood samples were tested for HBsAg and hepatitis C virus antibodies. Results were analyzed by using SPSS16 (Statistical package for social science16)

RESULTS: A total number of 200 confirmed tuberculosis patients were studied. 127 patients (63.5%) were males. The seroprevalence of HBV and HCV in this study were 9.5% and 3.5% respectively. Two patients (1%) were infected with both infections. The HBV vaccination among the study group was 6%.

CONCLUSION: The HBV and HCV infections are common among tuberculosis patients with seroprevalence of 9.5% and 3.5% for HBV and HCV respectively. Our study also showed that there are multiple risk factors for contracting HBV and HCV infections in our patients, so screening for these viruses should be included in the national TB control program.

Keywords: mycobacterium, East Mediterranean, hepatotoxicity.

The overall estimated death rate related to TB in Sudan is 24 per 100,000 populations3. There are 345 TB centers in Sudan3, 74 percent of them in Khartoum state4 all are well equipped with aids for diagnosis and treatment3. TB produces its lethal affect through the disease itself or by hepatotoxicity occurring during treatment. There are several factors that increase this hepatotoxicity of anti-tuberculosis therapy one of them is viral hepatitis namely HBV and HCV. HBV affect more than two billion people worldwide and 350 million people are chronic carrier5. Sudan is among countries with high endemicity of more than 8%5 and the seroprevalence of HBV is 5.1 and 5.6% among blood donors in northern and central Sudan respectively6. The HCV worldwide affects 170 million and the seroprevalence in

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Sudan equals 2.2 % - 4.8 % with predominance of genotype 4. The presence of concomitant infection of tuberculosis and viral hepatitis namely HBV and HCV during treatment of tuberculosis increases the risk of hepatotoxicity as many studies reveal and even may lead to death. This reflects the importance of screening of HBV and HCV among tuberculosis patients to decrease death and comorbidities among tuberculosis patients.

Methodology:
This is a prospective cross sectional hospital-based study. The study populations were 200 confirmed TB patients and were on antituberculous treatment and managed in TB center during the period 2010-2011, at TDH in the capital Khartoum. TB center is well equipped with aids for diagnosis and treatment supervised by Sudan National TB program and is run by trained medical personnel who verify the documentation and transfer of patient data from the hospital medical records into an electronic software system.

TDH is a referral Ministry of Health hospital, Sudan. This hospital was founded in 1974 for research, service, and training on tropical and infectious diseases, mainly visceral leishmaniasis, malaria, TB and schistosomiasis.

The demographic and clinical data were collected via questionnaires adopted for the study. Blood samples drawn under aseptic conditions from patients diagnosed with tuberculosis were tested for HBsAg, and HCV antibodies. SD BIOLINE HBsAg test, which is an in-vitro immunochromatographic, one step assay designed for qualitative determination of HBV in human serum or plasma was used for detection of HBV. This test has relative sensitivity of 100 percent, and relative specificity of 100 percent. On the other hand, the SDBIOLINE HCV test, which is an immune chromatographic test for qualitative detection of antibodies specific to HCV, in human serum plasma or whole blood was used for detection of HCV. It has sensitivity of 100 percent and specificity of 99.4 percent. All tests were done in a well-equipped laboratory by well expertise personnel in TDH. Computer assisted analysis, using statistical program for social sciences (SPSS) version 16, was employed.

The study was approved by the Research and Ethics Committee of tropical Diseases Hospital, Sudan. Written consent was taken from selected subjects prior to questionnaire filling and blood sampling. Patient’s

Table 1: Demographic features of 200 pulmonary TB study population

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>127</td>
<td>63.5</td>
<td>63.5</td>
</tr>
<tr>
<td>Female</td>
<td>73</td>
<td>36.5</td>
<td>36.5</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;40 years</td>
<td>140</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>≥40 years</td>
<td>60</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>84</td>
<td>58</td>
<td>58</td>
</tr>
<tr>
<td>Married</td>
<td>116</td>
<td>42</td>
<td>42</td>
</tr>
<tr>
<td><strong>Residence</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Urban</td>
<td>29</td>
<td>14.5</td>
<td>14.5</td>
</tr>
<tr>
<td>Rural</td>
<td>171</td>
<td>85.5</td>
<td>85.5</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>115</td>
<td>57.5</td>
<td>57.5</td>
</tr>
<tr>
<td>Unemployed</td>
<td>85</td>
<td>42.5</td>
<td>42.5</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educated</td>
<td>135</td>
<td>67.5</td>
<td>67.5</td>
</tr>
<tr>
<td>Illiterate</td>
<td>65</td>
<td>32.5</td>
<td>32.5</td>
</tr>
</tbody>
</table>
confidentiality, privacy and dignity were guaranteed; also the information obtained remained strictly protected. This was achieved through the safe keeping of the completed forms and the entry of personal data on computer only as a code and sending blood samples to the laboratory as codes numbers.

Results:
The demographic features of 200 pulmonary TB study patients were illustrated in Table 1. 140 (70%) patients were found in the age group less than 40 years and 127 (63.5%) patients were males, 171 (85.5%) patients were from rural areas, 116 (58%) patients were married, 65 (32.5%) patients were illiterate. Only 24 (12%) patients have governmental jobs. History of blood transfusion, jaundice, vaccination against HBV was found in 19 (9.5%), 49 (24.5%) and 12 (6%) of patients respectively.

Table 2: Risk factors for HBV and HCV infection in all patients with TB

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood transfusion</td>
<td>Yes</td>
<td>19</td>
<td>9.5</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>181</td>
<td>90.5</td>
</tr>
<tr>
<td>Jaundice</td>
<td>Yes</td>
<td>49</td>
<td>24.5</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>151</td>
<td>75.5</td>
</tr>
<tr>
<td>HBV vaccination</td>
<td>Yes</td>
<td>12</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>188</td>
<td>94</td>
</tr>
<tr>
<td>I.V drug abuse</td>
<td>Yes</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>200</td>
<td>100</td>
</tr>
</tbody>
</table>

Table3: Demographic features and risk factors of patients with HBV positive screen

<table>
<thead>
<tr>
<th></th>
<th>Frequency</th>
<th>Percent</th>
<th>Valid percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
<td>16</td>
<td>84.2</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>Age</td>
<td>&lt;40years</td>
<td>12</td>
<td>63.2</td>
</tr>
<tr>
<td></td>
<td>≥40years</td>
<td>7</td>
<td>36.8</td>
</tr>
<tr>
<td>Marital status</td>
<td>Married</td>
<td>9</td>
<td>47.7</td>
</tr>
<tr>
<td></td>
<td>Single</td>
<td>10</td>
<td>52.3</td>
</tr>
<tr>
<td>Residence</td>
<td>Rural</td>
<td>7</td>
<td>36.8</td>
</tr>
<tr>
<td></td>
<td>Urban</td>
<td>12</td>
<td>63.2</td>
</tr>
<tr>
<td>Occupation</td>
<td>Unemployed</td>
<td>7</td>
<td>36.8</td>
</tr>
<tr>
<td></td>
<td>Employed</td>
<td>12</td>
<td>63.2</td>
</tr>
<tr>
<td>Education</td>
<td>Illiterate</td>
<td>7</td>
<td>36.8</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>Blood transfusion</td>
<td>No</td>
<td>19</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>3</td>
<td>15.8</td>
</tr>
<tr>
<td>Jaundice</td>
<td>No</td>
<td>16</td>
<td>84.2</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>HBV vaccination</td>
<td>No</td>
<td>19</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>0</td>
<td>0.00</td>
</tr>
<tr>
<td>I.V drug abuse</td>
<td>No</td>
<td>19</td>
<td>100</td>
</tr>
</tbody>
</table>
On the other hand none of them gave history of intravenous drug abuse Table 2.

The seroprevalence of HBV in the study was 9.5% (19 patients), 16 (84.2%) of them were males and 15 (78.9%) were in the age group less than 40 years. All patients with positive screening test were not vaccinated against HBV (Table 3).

Table 4 shows demographic features and risk factors of patients with HCV positive screen. Two patients (1%) were infected with both infections. The HBV vaccination among the study group was (6%).

**Discussion:**

The present study represents to the best of our knowledge the first study in Sudan about the seroprevalence of hepatitis B and C virus among TB patients. Our study is the first to indicate that infection with HBV and HCV is a significant problem among patients with tuberculosis in Sudan. Although it is a common problem in Sudan, hepatitis B and C viruses screen was not done as routine as HIV test among patients with TB, this may be due to limited resources.

Co-infection with hepatitis B or C Viruses among tuberculosis patients potentiate the risk of antituberculous therapy induced hepatotoxicity, so we should exercise caution and carefully monitor our patients for drugs associated hepatotoxicity.

In this study the seroprevalence of hepatitis B virus was 9.5% and it was higher than the seroprevalence among general population and blood donors in Sudan (6.8%)\(^5\), (5.6%)\(^6\) respectively and lower than seroprevalence of HBV in Brazil which showed seroprevalence of 14.6% among patients with tuberculosis\(^12\). This may be due to the high prevalence (14%) of HBV in that country\(^13\). Also the seroprevalence of HBV in our study is lower than in India which showed seroprevalence of HBV among pulmonary tuberculosis patients of 15\%\(^14\) despite the relatively low seroprevalence of HBV in that country (4%)\(^15\).

The majority (78.9%) of our patients who were positive for HBV was young (< 40 years). The seroprevalence of HBV was static thereafter indicating that being young (< 40 years) is possibly a risk factor for contracting HBV infection which is compatible with the literature. Going with reports, 12 (57.8%) patients positive for HBV...
in this study were from rural areas with low socioeconomic status.
Similar to a previous study in Eastern Sudan\(^6\), the majority (84.2\%) of our HBV positive patients were males, accusing gender as a risk factor for HBV infection.
Our study also showed none of HBV positive patients have history of blood transfusion and this may reflect the effectiveness of the measures taken by your blood banks and this is consistent with a study done in Sudan in general population which showed no association with blood transfusion and HBV infection\(^5\).
The majority (84.2\%) of our HBV positive patients have no history of jaundice, and this reflect the fact that the disease commonly occurs in subclinical asymptomatic pattern as mentioned in literature.
Vaccination rate against HBV was very low (6\%) among the population studied and none of HBV positive patients was vaccinated. This highlights the need for intensifying the vaccination program in our community.
In this study the seroprevalence of HCV among tuberculosis patients was 3.5\% and this was higher than that among general population in Gezira area (2.2\%)\(^8\) and lower than that among tuberculosis patients (19.4\%) reported in a high epidemic country in which it was attributed to high risk factors such as intravenous drug abuse\(^16\).
Our results showed there are four patients (52.1\%) among HCV positive patients in age group less than 40 years, and one patient (14.3\%) in age group 40-60 years and two patients (28.6\%) in age group more than 60 years, and this differ from the literature which showed that the infection was common in age from 40-49 years. Our figures are small so it is difficult to draw conclusions. Further studies may be needed in the future to determine the others risk factors among our patients such as intravenous drug abuse.
Our results showed that six (85.7\%) patients with HCV were males and this is consistent with literature\(^16\). History of jaundice among HCV positive patients was lacking, and this is consistent with reports from elsewhere. This highlights the importance of screening for HCV and doing liver function test among patients with high risk for infection such as TB patients so as to discover the occult infection early. Before drawing conclusions we have to admit that the numbers in this study were very small, so larger studies are highly recommended to support or disprove our results.

**Conclusion:**
The present study showed that hepatitis B and C virus’ infection is common among tuberculosis patients. Infection with HBV or HCV may occur without any history of jaundice. Male gender, age less than 40 years and low socioeconomic status are main risk factors for HBV and HCV infection which are shared with TB. No role for blood transfusion in transmission of HBV or HCV infection in this study.
There is low coverage of HBV Vaccination among the study group. Our study also showed that are multiple risk factors for contracting TB and (HBV, HCV) infections, so screening for these viruses should be included in the national TB control program before and during anti tuberculosis treatment.

**References:**
7. Ayoola EA, Gadour MO. Hepatocellular carcinoma in Saudi Arabia: role of hepatitis B and


