Abstract. – AIM: To determine the seroprevalence of Hepatitis B (HBV) among Turkish immigrants living in Germany.

SUBJECTS AND METHODS: A cross-sectional, multi-centered study was conducted among 1319 Turkish immigrants who were living in Germany and admitted to the clinics for any reason. Participants were tested for Hepatitis B surface antigen (HBsAg), hepatitis B surface antibody (Anti-HBs) and antibodies to hepatitis B core antigen (Anti-HBc).

RESULTS: 37.3% of the participants were tested positive for Anti-HBc. Of these, 45.8% percent was showed positivity for anti-HBc. 25.6% of all donors were showed positive results for Anti-HBC. HbsAg seroprevalence was found as 5%. Furthermore, 90% of participants with positive HBsAg had positive results for Anti-HBc. Males had significantly higher rates of Anti-HBc and HBsAg positivity than females.

CONCLUSIONS: Turkish immigrants living in Germany represented higher seroprevalence rate of HBV than total population of Germany.

Key Words: Hepatitis B virus, Immigrants, Turkish, Germany, HBV seroprevalence.

Introduction

Hepatitis B virus (HBV) is one of the major infectious diseases worldwide, with the estimated number of infected people being more than 2 billion. Of these, approximately 350 million people remain infected chronically. Hepatitis B virus is the most common cause of hepatitis, liver cirrhosis and responsible for 80% of hepatocellular carcinomas. HBV has high mortality rates of 600,000 deaths every year resulting from its short and long term consequences. Since the prevalence of chronic hepatitis differs geographically, countries classified as low (< 2%), intermediate (2-7%) and high (> 8) prevalence based on the serum Hepatitis B surface antigen (HBsAg) positivity. Although the highest incidence rates of the disease occur in Asia; sub-Saharan Africa, South America and Alaska are also considered in the high incidence category. Additionally, high rates of the disease occur in southern sides of the Central and Eastern Europe. HBV is transmitted through the body fluids of the person with HBV infection, and highest titers of the virus are found in blood and serum while the semen and saliva have the lower concentrations. The HBV is mainly transmitted perinatally, parenterally and with sexual contact. Perinatal transmission occurs majorly in the areas with high-endemicity. On the other side, sexual route is thought to be the major transmission pathway worldwide; however, it is principally seen in low-endemicity areas. Parenteral transmission is seen in United States and Western Europe and, intravenous drug usage is an important risk factor. Moreover, parenteral transmission includes the transmission during the surgery, dialysis, tattooing and piercing.

There is a diversity of the prevalence of the HBV in Europe and the estimated HBV carrier rates ranges between 0.1% to 8.0%. In Germany, the HBV seroprevalence ranges from 0.5% to 1.5% and the incidence had been decreased from 7.5 to 1.4 cases per 100,000 inhabitants from 1995 to 2005. However, it is difficult to estimate the true annual incidence due to under-reporting and missed subclinical cases. Studies showed that HBsAg prevalence in migrants is higher than in general population. 84% of adult migrants in Germany are from intermediate/high HBV prevalence countries. Germany has 7.3 million foreigners in its population and 2.4% of the total population of Germany is constituted by Turks. The HBV infection prevalence in Turkey is stated as 4.57% and it is considered as intermediate-endemicity. Since Turkey is the major source of
immigration to Germany, screening Turkish immigrants living in Germany has a significant importance. In order to provide an effective health control, it is essential to know the epidemiology of the illness in specific regions and subpopulations.

In this cross-sectional study we investigated the seroprevalence of HBV infection in Turkish immigrants living in six different cities of Germany.

**Subjects and Methods**

**Study Design**

A cross-sectional descriptive study was conducted among 1319 Turkish immigrant patients from 6 different centers of Germany (Dreieich, Frankfurt, Ludwigshurg, Ludwigshafen, Stuttgart, and Wuppertal), during a 12 months period. Study was done with the approval of Giessen University Ethics Committee. The participants who administered to corresponding clinics for any reason were randomly selected. The number and sexual distribution of included patients according to centers were shown in Table I.

**Data Collection and Serological Parameters**

An informed consent was taken from every participant before the clinical examination. The patients, who were Turkish being in any of these six cities for the purpose of tourism were excluded from study. Venous blood samples were drawn from every participant in order to measure serological markers for HBV infection. Enzyme immunoassays were performed in order to analyze the venous blood samples for anti-HBe, HBsAg, and Anti-HBs.

Anti-HBs analysis was performed in order to find out the participants who were provided immunity to HBV infection via vaccination or previous infection. Anti-HBe antigen from serum was measured in order to determine whether any participant ever had an HBV infection previously, was having at that moment or not. Furthermore, HBs-Antigen analysis was done for detection of participants who were infectious.

**Statistical Analysis**

Each parameter collected from six different cities was distributed as male and female. The comparison of the male-female values and comparison of the values of four different ranges of age were done based on the Fisher’s exact test using the SPSS 20.0 program. $p < 0.05$ was considered as statistically significant. Data was expressed in mean ± SD.

**Results**

1318 donors were tested for Anti-HBs antibody and 37.3% of them demonstrated positive results. Stuttgart was the city having the highest rate which was 40%, on the contrary, Ludwigshafen had the lowest rate for Anti-Hbs positivity of 28%. When genders were compared,
Anti-Hbs analysis did not show any significant differences ($p > 0.05$). Serological results of Anti-HBs antibody were shown in Table II.

It was found that there was a rate of 25.6% Anti-HBc positivity among 1287 Turkish immigrants, highest in Dreieich, lowest in Ludwigshafen. When the results of total Anti-HBc analysis were distributed by sex, it was found that the rates of the male patients were significantly higher than that of female patients ($p < 0.05$). The study further showed that the rate of Anti-HBc raised with the increase in age groups. Additionally, it was stated in each of four age groups, except the group aged 55 and older, men had significantly higher rates of Anti-HBc positivity than women (Figure 1).

Of those with positive Anti-HBs antibody, 45.8% percent was showed positivity for anti-HBc while 51.7% had negative results. There were 12 participants who were not tested for Anti-HBc. When the patients were distributed into four age groups, it was shown that the age groups younger than 35 had significantly higher negative rates than the age groups ($p < 0.0001$) (Table III).

5% of 1285 patients who were tested for HBsAg had positive results. Highest rates of HBsAg positivity was shown in Frankfurt and Ludwigsburg whereas Ludwigshafen had the lowest rates (Table IV). This positivity was significantly higher in men with the rate of 7% than in women with that of 3.5% ($p < 0.05$). No significant differences were shown among four age groups regarding the antigenic positivity ($p > 0.05$). Moreover, of participants with positive HBsAg (n=64), 58 had positive results for Anti-HBc.

### Table II. Distribution of Anti-HBs according to study centers.

<table>
<thead>
<tr>
<th>Centers</th>
<th>Number (n)</th>
<th>Percentage (%)</th>
<th>Negative</th>
<th>Positive</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dreieich</td>
<td>25</td>
<td>66%</td>
<td>13</td>
<td>34%</td>
<td>100%</td>
</tr>
<tr>
<td>Frankfurt</td>
<td>260</td>
<td>61%</td>
<td>166</td>
<td>39%</td>
<td>100%</td>
</tr>
<tr>
<td>Ludwigsburg</td>
<td>49</td>
<td>62%</td>
<td>30</td>
<td>38%</td>
<td>100%</td>
</tr>
<tr>
<td>Ludwigshafen</td>
<td>81</td>
<td>72%</td>
<td>32</td>
<td>28%</td>
<td>100%</td>
</tr>
<tr>
<td>Stuttgart</td>
<td>24</td>
<td>60%</td>
<td>16</td>
<td>40%</td>
<td>100%</td>
</tr>
<tr>
<td>Wuppertal</td>
<td>388</td>
<td>62%</td>
<td>234</td>
<td>38%</td>
<td>100%</td>
</tr>
<tr>
<td>Total</td>
<td>827</td>
<td>63%</td>
<td>491</td>
<td>37%</td>
<td>100%</td>
</tr>
</tbody>
</table>

### Discussion

Hepatitis B viral infection is a common infection worldwide affecting about 350 million people chronically. The prevalence of the disease is changeable in a population due to various factors such as ethnic differences and population movements. Migration is an important factor affecting prevalence of HBV infection because of the fact that immigrants have higher prevalence of HBsAg and Anti-HBc than the generalized population since they live in poorer conditions. In Germany, 19% of all population has a history of migration and 84% of this migrant population is immigrated from countries which have high or intermediate HBV prevalence. Three major countries from which the migrants are coming are Turkey, Italy and Former Yugoslav. Since Turkey is considered as an intermediate risk country for Hepatitis B virus with the estimated prevalence of 4.57%, migration from this country should be taken importance in terms of the epidemiology of the disease.

In our study we investigated the seroprevalence of the HBV in Turkish immigrants who migrated to six cities of Germany. The average HBsAg prevalence was found as 5% among Turkish immigrants. On the other side, although Germany is considered as a country with low (< 2%) hepatitis B virus endemicity, total HBsAg positivity of the three major migrant groups living in Germany was formerly found as 4.0%. Moreover, Germany has the ratio of 5.9% indicating the percent of all immigrants with chronic HBV.
Based on a systemic review done by Toy et al.\textsuperscript{14}, total seroprevalence of HbsAg in Turkey is between 4.0%-5.0%. However, no recent data showing the prevalence of HBV infection in Turkey was found. Furthermore, it is known that Turks who are living in their native country or migrated to another country are in the high-risk groups and should be screened for HBV\textsuperscript{6}. In our study, the positivity of HBsAg and Anti-HBc in Turkish participants were found 5\% and 25.6\% respectively and these rates are higher than those of total population of Germany.

Fisher et al.\textsuperscript{16} showed in their multi-centered study that 37\% of chronically active patients from 74 German centers were HbeAg-positive and 63\% of these patients were immigrants mostly consisted of Turks. This study stated the epidemiology of chronic hepatitis B was affected by the migration from countries with higher HBV prevalence. Another study done by Back E et al.\textsuperscript{17} showed that Assyrian children who migrated from Turkey were represented a HBV transmission risk which was the same risk in Turks' general population whereas those migrated from Sweden did not showed any risk for this transmission.

According to van der Veen YJ et al.\textsuperscript{18}, the Turkish immigrants living in the Netherlands also had higher HBV prevalence compared with the total population of the Netherlands. As reported, positive factors for getting screened for HBV included responsibility, religious beliefs, feeling obligated due to the periodic invitations and provided social support. On the other side, factors limiting the screening were association of HBV with sexually transmitted diseases, and the thought that the health care services were not effective enough.

\textbf{Table III.} Anti-HBc seropositivity in participants with + Anti-Hbs according to age groups.

<table>
<thead>
<tr>
<th>Age groups</th>
<th>Number (n)</th>
<th>Positive</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;= 34 Years</td>
<td>65</td>
<td>15</td>
<td>80</td>
</tr>
<tr>
<td>35-44 Years</td>
<td>48</td>
<td>46</td>
<td>94</td>
</tr>
<tr>
<td>45-54 Years</td>
<td>53</td>
<td>64</td>
<td>117</td>
</tr>
<tr>
<td>&gt;=55</td>
<td>56</td>
<td>70</td>
<td>126</td>
</tr>
<tr>
<td>Total</td>
<td>222</td>
<td>195</td>
<td>417</td>
</tr>
</tbody>
</table>
Niederer et al.\textsuperscript{19} investigated the epidemiology of chronic HBV in Germany in 250 patients. They stated that two thirds of the patients with chronic HBV were immigrants from other countries and they had serious financial problems. Furthermore, a population based prospective study conducted in 524 patients in Hamburg\textsuperscript{20} showed that the incidence was 3.5 times higher in immigrants than in Germany-born patients. Additionally, the main risk factors were stated as parenteral drug use with the rate of 17.7\% and immigration with the rate of 13.9\%.

Authors acknowledge that the number of participants were not equally distributed in each study centers. Moreover, there were missing data on some baseline characteristics and serological results. However, we assume that these missing data had minor influence on the analysis outcome.

In the comparison of these investigations with our study, there is a parallel relationship highlighting that the seroprevalence of the Hepatitis B virus occurred in higher rates in Turkish immigrants. The recommendation strategies has common points based on the prevention and screening programmes focusing on the high risked, targeted groups such as Turkish immigrants.

**Conclusions**

Turkish immigrants living in Germany have higher seroprevalence of HBV compared to total population of Germany. Therefore, the prevention and screening programs should be improved.

![Table IV: Seroprevalence of HBs-Ag by six cities.](image)

<table>
<thead>
<tr>
<th>Centers</th>
<th>HBsAg</th>
<th>Number (n)</th>
<th>Percentage (%)</th>
<th>Total (n)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dreieich</td>
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**Conflict of Interest**

The Authors declare that there are no conflicts of interest.

**References**

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