

Original article ■

Epidemiological Characteristics of Carrying Viral Hepatitis B Antigen in the Population of the Nišava District

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SUMMARY

The aim of this paper was to determine the trend of diseases and epidemiological characteristics of viral antigen carrying of hepatitis B for better implementation of prevention and control of the disease activity. The annual reports, reports of diseases - deaths from infectious diseases, epidemiological survey of the Public Health Institute (IPH) Niš were used as the material. The period from 2002 to 2011 in the Nišava District was considered. A descriptive method was used. HBsAg carrying shows an upward trend ($y=15+3.27 x$). Most carriers are males (57.27%), live in urban areas (98.16/100.000 population), average age 41.92 years old \pm SD 18.59, pensioners (22.42%). 54.05% are nephrology patients (almost all retirees under the age of 60 years old). Only 15.76% were hospitalized. The data on the vaccination status are insufficient. In 5.45%, co-infection with hepatitis C virus was found. 63.33% belong to the group of patients for whom there were no data on the mode of transmission. Hemodialysis patients make 16.67%, blood donors 9.39%, 6.36% pregnant women and injecting drug users 1.21%. The upward trend of carrying, the presence of all known risk groups in the population of carrying in the Nišava District points to the need for improved epidemiological surveillance, strict application of protective measures, conducting of statutory vaccination of all categories of people exposed to particular risk of infection as well as continuing education on preventive measures of both population and health care providers.

Key words: epidemiology, carrying, HBsAg, trend, vaccination

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INTRODUCTION

Hepatitis B infection is caused by the infection with the hepatitis B virus (HBV). As we refer to anthroponosis, the infected person (patient or carrier) is the only source of infection. It is transmitted through contact, and it is easily transferred due to high resistance in the environment and high concentration of virus in the blood and body fluids. The incubation period is approximately 75 days, and ranges from 45 to 180 days. In 10% of people the virus remains in the blood after 6 months and they become chronic carriers of Hepatitis B surface antigen (HBsAg). According to the World Health Organization data, 2 billion people have serological confirmation of curing or the presence of HBV infection. It is estimated that between 350 and 400 million people worldwide have chronic HBV infection. 5% of the population are registered as carriers of HBsAg. Approximately one third of all cases of cirrhosis and half of all cases of hepatocellular carcinoma (HCC) can be attributed to chronic HBV infection (1-5).

In the routine daily work, the presence of infection and carrying of antigen is documented by detection of HBV surface antigen-HBsAg ELISA test. Healing phase and successfully executed vaccination is characterized by the appearance of anti-HBs antibodies in serum (6, 7).

Due to the vaccine this infection can be prevented. The main objective of the strategy of immunization against hepatitis B is to prevent chronic HBV infection and its serious consequences, including liver cirrhosis and HCC.

The vaccine can be given as a monovalent or combined with other vaccines (DiTe Per, Hepatitis A, Hib or IPV). Immediately after birth only a monovalent vaccine is given. Infant vaccination reduces globally the risk of the disease. It is estimated that 620.000 people around the world die annually for reasons related to HBV infection: 94% due to cirrhosis and HCC associated with chronic HBV infection, and 6% of acute hepatitis B. Routine vaccination against hepatitis B in childhood with success of 90% and the first dose given at birth should prevent 84% of all deaths associated with HBV infection (8).

Cases of diseases caused by hepatitis B in the territory of the Nišava District have been registered since 1978 and carrying of viral hepatitis B antigens since 1986.

AIM

The aim of this paper was to determine the trend of diseases and epidemiological characteristics of viral antigen carrying of hepatitis B for better implementation of prevention and control of the disease activity.

MATERIALS AND METHODS

The annual reports of the Public Health Institute (IPH) Niš, reports of diseases - deaths from infectious diseases, epidemiological survey of the Department of Sexually Transmitted Infections were used as the materials. The period from 2002 to 2011 in the Nišava District was considered. A descriptive method was used. Rates are non-standardized and were calculated per 100.000 residents. For statistical analysis of data, the Microsoft Office Excel 2003 and PASW Statistics18 were used.

RESULTS

Carrying of viral hepatitis B antigens in the period from 2002 to 2011 in the Nišava District was registered in 330 persons. Unadjusted rate of carrying in the population of the Nišava District was 82.43/100.000 population for the observed period. The majority of HBsAg carriers was recorded in 2010 - 67 (20.30%) and the lowest number in 2005 - 19 carriers (5.76%). A third was reported in the last two years (123 or 37.27%). 75.15% of all carriers of hepatitis B antigen are in the Municipality of Niš. The Municipality of Aleksinac is in the second place with 14.85%. The Municipality of Ražanj has the lowest number of registered carriers of HBsAg - 2 (0.61%), followed by the Municipal of Doljevac with 3 cases (0.91%). Unadjusted rates of carrying in the Municipalities of Niš and Aleksinac are also the highest - in the Municipality of Niš it is 429.44, and in the Municipality of Aleksinac 84.85/100.000. Continuous registration is recorded only in the Municipality of Niš, while in the others it is absent or the discontinuity is reported.

As shown (Figure 1), HBsAg carrying in the territory of the Nišava District shows an upward trend of $y = 15 + 3.27x \pm R^2 = 0.38$. In the Municipality of Niš in the observed period there is also an upward trend ($y = 8.27 + 3.01x$, $R^2 = 0.47$).

The majority of the carriers are from the group of 60 years old and over (19.39%) and 40-49 years old (18, 79%). However, the highest rate of carrying is from the group of 40-49 (106.01) and 20-29 years old (105.47) (Figure 2). The average age of HBsAg carriers is 41.92 years \pm SD 18.59. The highest rate of HBsAg carrying is recorded in men aged 50-59 years old (143.76) and women aged 20-29 years old (132.68). Children aged 0-4 years old in 11 patients have a rate of 64.84 per 100.000.

The highest proportion of carriers is among males (189 or 57.27%). Unadjusted rate of carrying in men is 96.05 per 100,000 and it is 1.39 times higher than the non-standardized rate of carrying in women (69.7 per 100,000). The same rate ratio of both sexes is obtained in the Municipality of Niš. In the Municipality of Aleksinac the rate ratio of sexes is 1.27 times higher for men.

In relation to residence, 63.33% are from urban areas (Table 1). The rate of carrying in relation to the place of residence is 1.52 times higher in urban compared to rural area (98.16 vs. 64, 56 / 100,000) although the municipalities of Gadžin Han, Doljevac, Merošina and Ražanj count as rural settlements by 2002 census. 90.43% of carriers in urban areas and 48.76% of carriers in rural areas are from the municipality of Niš (rate of 106.08 vs. 81, 54 / 100,000 population). In the municipality of Aleksinac there are more carriers from rural areas (the rate of 86.93 vs. 80, 48 / 100,000 population). Although the municipality of Svrlijig has an equal number of carriers from the village and the town the rate of carrying is higher in the urban area (51.91 vs. 41.76 / 100,000).

The carrying of HBsAg does not have seasonal occurrence. According to the data from the PHI Niš the majority of carrying of HBsAg was registered in February (11.52%) and the least in June (4.85%).

The majority of carriers are from the group of retirees (from 35 to 79 years old) - 22.42% (Figure 3). More than a half (54.05%) are nephrology patients (almost all retirees from 35 to 60 years old). The workers who cannot be classified by occupation make 21.81% and 13.94% are unemployed. In the group of 72 workers without certain occupation there are 15 blood donors, 9 inmates of the Home for Children and Young Peo-

ple with Difficulties in Mental Development in Kulina and 8 patients from Special Hospital for Psychiatric Illness in Gornja Toponica.

Children who do not attend classes (from 0 to 19 years old) make up 5.15%, 11 are pre-school children (3.33%), of whom six are less than a year old, while the rest belong to the children aged up to 18 years old from the Home for Children and Young People With Difficulties in Mental Development. In the observed period health workers (one doctor, one pharmacist, three nurses), make 1.52% of HBsAg carriers.

Due to the carrying of viral hepatitis B antigen 15.76% were hospitalized. Insufficient data on vaccination status of carriers are in the reports of carrying. In 18 individuals (5.45%) co-infection with hepatitis C virus was found.

Of 330 HBsAg carriers, 63.33% belong to the group of tested patients for whom there is no information on the mode of transmission (Table 2). In this group there are also 17 children from the Home for Children and Young People With Difficulties in Mental Development in Kulina, 8 patients from Special Hospital for Psychiatric Illness in G. Toponica and 2 inmates of the Correctional Institution (OCA) in Nis. Hemodialysis patients make 16.67% of carriers, blood donors 9.39%, pregnant women 6.36% and injecting drug users 1.21%.

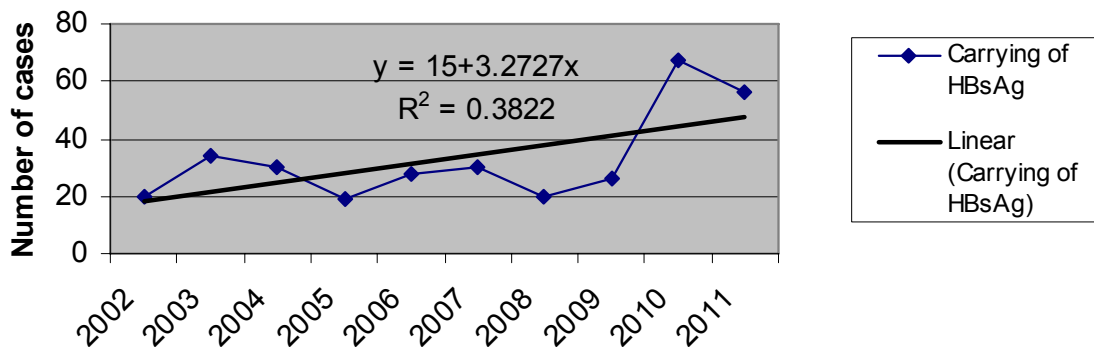


Figure 1. The trend of HBsAg carrying in the Nišava District from 2002 to 2011

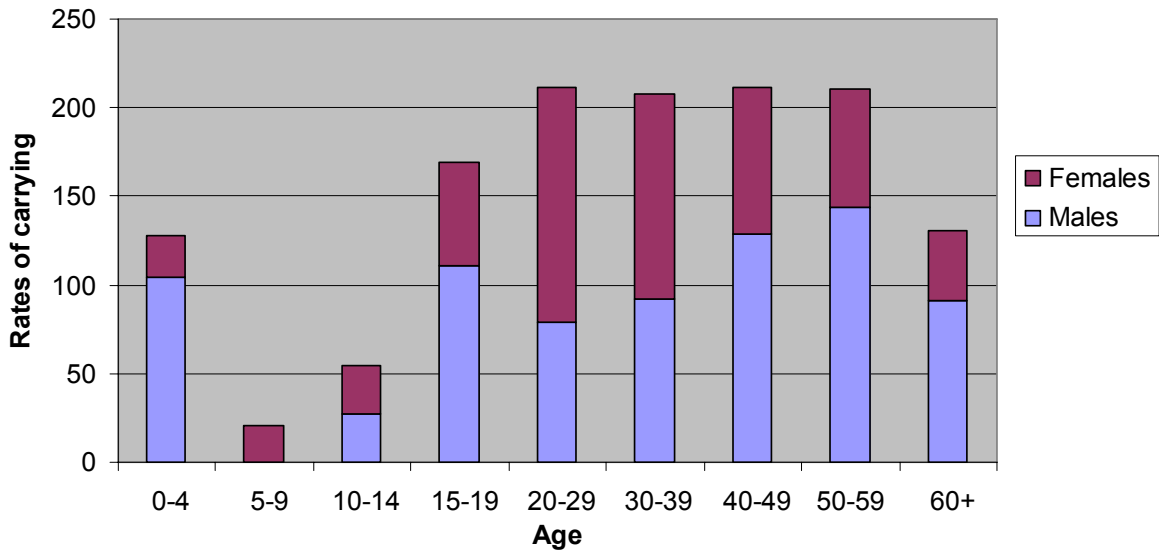


Figure 2. Distribution by sex and age of HBsAg carriers in the Nišava District from 2002 to 2011

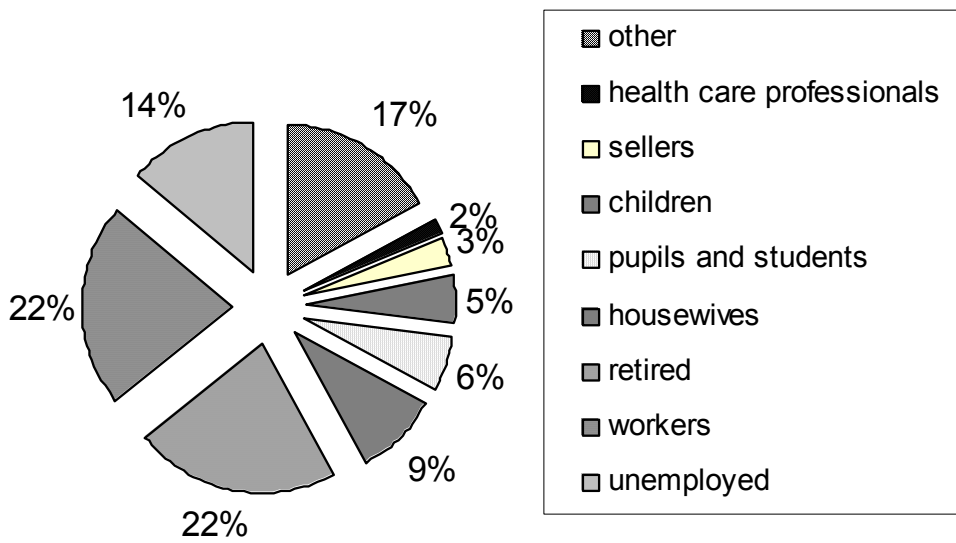


Figure 3. Occupation of HBsAg carriers in the Nišava District from 2002 to 2011

Table 1. Distribution of HBsAg carriers by place of residence in the Nišava District from 2002 to 2011

| Municipality | Village | | City | |
|--------------|-----------------|--------------|-----------------|--------------|
| | Number of cases | Rate | Number of cases | Rate |
| Aleksinac | 34 | 86.93 | 15 | 80.48 |
| Gadžin Han | 3 | 28.67 | 0 | 0.00 |
| Doljevac | 9 | 46.01 | 0 | 0.00 |
| Merošina | 6 | 40.51 | 0 | 0.00 |
| Niš | 59 | 81.54 | 189 | 106.08 |
| Ražanj | 2 | 17.59 | 0 | 0.00 |
| Svrljig | 4 | 41.76 | 4 | 51.91 |
| Sokobanja | 4 | 39.35 | 1 | 11.89 |
| Total | 121 | 64.56 | 209 | 98.16 |

Table 2. Transmission groups of holders of HBsAg in Nišava district from 2002 to 2011

| Transmission group | Number of cases | % |
|--------------------------------|-----------------|---------------|
| Outpatient - polyclinic tested | 209 | 63.33 |
| Hemodialysis | 55 | 16.67 |
| Heterosexuals | 2 | 0.61 |
| Injecting drug users | 4 | 1.21 |
| Sexual partner HBsAg positive | 1 | 0.30 |
| Mother HBsAg positive | 2 | 0.61 |
| Pregnant women | 21 | 6.36 |
| Health professionals | 5 | 1.52 |
| Blood donors | 31 | 9.39 |
| Total | 330 | 100.00 |

DISCUSSION

Carrying of HBs antigen in the population of the Nišava District from 2002 to 2011 shows an upward trend ($y=15+3.27x$, $R^2=0.38$). From 1986 to 2001 the trend in the number of newly registered carrying of viral hepatitis B antigen was slightly increased ($y=16+0.69x$, $R^2=0.04$). The increase is especially noticeable in the last two years. In the Republic of Serbia the number of carrying of hepatitis B antigen is increasing, while in 2011 the rate of registered HBsAg carriers in Vojvodina was higher than in central Serbia (4.79:4.76/

100000). Every tenth HBsAg carrier in the territory of Serbia comes from the territory of the Nišava District (10.65%), while in 2011 they make 16.05%, and in 2010 even one-fifth (21.47%) (9). The increased registration of carrying of HBsAg in the last two years in the population of the Nišava District can be attributed to the increased surveillance of hepatitis by the Center for Disease Control and Prevention on the one hand, and increased surveillance over the reporting of isolated infectious agents in private and government laboratories. In addition, underregistration of carriers for failure to report and the lack of reagents is possible. Besides, chronic unpredictable lack of the vaccine against hepatitis B re-

duces the possibility of preventive care for people who are at risk and compromises the possibility of covering the majority of the population with vaccination.

In comparison, in the cross-sectional study done at Subcarpathian and Southeastern Romania the prevalence of HBsAg of 5.59% is obtained, which is similar to the Balkan countries (Greece 7.3 to 8%, Albania 5,3-12%, Italy 2 to 5.1 %) (10). In Azerbaijan, the prevalence of HBsAg is 3% (11).

In the Nišava District, the most common carriers of HBsAg - 22.42% are pensioners. Pupils and students are at the fifth place in the number of carrying (6.06%). Primary and secondary school students are more registered as carriers of HBsAg than university students (20:6). In Pakistan among the students of Medical and Dental College in Lahore, determined seroprevalence of HBsAg carrying is 1.1% (12).

Five health workers are registered as carriers of HBsAg. Accidental injury in the operating room occurred with a doctor. In the two hospitals in Jerusalem, it was found that the doctors and nurses working in dialysis and hematology/oncology and the laboratory technicians in biochemical laboratories and transfusion have anti-HBc prevalence of 32%, 28%, 27% and 24%, while it is the lowest among the administrative staff - 8% (13).

Even when vaccinated, the health care workers may be at risk of being infected by hepatitis B if they do not reach a protective antibody titer. A value of ≥ 10 ml IU per ml measured 1-3 months after administration of the last dose of the vaccine is considered to be protective antibody titer. Diseases such as HIV infection, chronic liver disease, diabetes, chronic renal insufficiency and low birth weight (<2000 grams) reduce the immunogenicity of the vaccine (14).

In the medical center in Jerusalem in health care workers who were vaccinated in 33% detectable levels of antibodies were not found 1-8 years after vaccination. Seroprevalence of anti-HBc antibodies of those medical workers is significantly higher than in the general population of Israel (15).

In the Nišava District, in the period from 2002 to 2011, coinfection with hepatitis B and C virus was found in 18 people (2.47%). In neighboring Bulgaria, the percentage of co-infection was 0.68% (16). It is considered that such co-infection can significantly increase the risk for development of hepatocellular carcinoma and it is common in areas with a high prevalence of hepatitis B (17-19).

The ambulatory outpatient group included 17 children from the Home for Children and Young People With Difficulties in Mental Development in Kulina, 8 patients of the Special Hospital for Psychiatric Illness in Gornja Toponica and 2 wards of Correctional Institution (CI) in Niš. The children from the Home in Kulina were not tested at admission before 2005, but this was done according to the indications, so in 2003 and 2004 two positive for HBsAg children were found in each year. In 2005 four new cases were registered while in 2011,

when the displacement of younger children in the Home in Sremčica began because the Home for Children and Young People With Difficulties in Mental Development in Kulina was changed to the Home for adults, 9 HBsAg positive children were found. From 2000 to 2002, there was an epidemic of viral hepatitis B in Kulina and then 10 residents of the Home were infected (4 hospitalized). The route of transmission was contact.

In the report of the Helsinki Committee for Human Rights (HO), which was composed after the tour of prisons in Serbia, it was stated that on two occasions during the period from April 2005 to April 2006 the medical care of prisoners in CI in Nis was questioned. Among other conditions, it was found that in the first quarter there were 17 drug addicts and in the second quarter 9 more drug addicts. There were not any HIV-positive people and by the end of that year two HBV-positive wards were registered. It was found that the prison has a problem with entering and mutual exchange of syringes among prisoners which increases the possibility of further infection with hepatitis B virus (20). In the cross-sectional study done in Iran it was found that HBsAg carrying was two times more common in prisoners than in the general population (21).

CONCLUSION

The carrying of viral hepatitis B antigens in Nišava District shows an upward trend. The low incidence rate may be the consequence of underregistration. Male sex makes 57.27% of all cases. In HBsAg carrying the average age is 41.92 years. The urban population prevails. Among the carriers of HbsA, the retired are the most numerous. The groups with increased risk for HBV infection are also present in the population of the Nišava District - hemodialysis patients, prison inmates and injecting drug users, children of the Home in Kulina (17 children were positive for HBsAg). Pregnant women accounted for 6.36% of HBsAg carriers. There is not sufficient data on the vaccination status of HBsAg carriers. In order to prevent outbreaks in health care and social care, it is necessary to carry out the statutory vaccination of all categories of people exposed to particular risk of infection and to promote continuing education on preventive measures of both population and health care providers. It is essential that there is continuity in the supply of sufficient quantities of the vaccine for all age groups to ensure the high coverage of the population.

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EPIDEMIOLOŠKE KARAKTERISTIKE NOSILAŠTVA ANTIGENA VIRUSNOG HEPATITISA B U POPULACIJI NIŠAVSKOG OKRUGA

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Sažetak

Cilj rada bio je da se utvrde trend nosilaštva i epidemiološke karakteristike nosilaštva HBsAg radi boljeg sprovođenja prevencije i kontrole aktivnosti ove bolesti. Kao materijal korišćeni su godišnji izveštaji, prijave zaraznih bolesti, epidemiološke ankete Instituta za javno zdravlje Niš. Sagledan je period od 2002. do 2011. godine na području Nišavskog okruga. Korišćen je deskriptivni metod rada.

Nosilaštvo HBsAg pokazuje uzlazni trend ($y=15+3.27x$). Više je registrovano kod osoba muškog pola (57,27%), iz gradske sredine (98.16/100000 stanovnika), prosečne starosti 41,92 godine $\pm SD=18,59$, penzionera (22,42%), 54,05% su nefrološki bolesnici (skoro svi penzioneri starosti do 60 godina). Hospitalizovano je samo 15,76%. Podaci o vakcinalnom statusu su insuficijentni. Kod 5,45% nađena je koinfekcija sa hepatitis C virusom, 63,33% pripada grupi bolesnika kod kojih ne postoje podaci o načinu transmisije. Bolesnici na hemodijalizi čine 16,67% nosilaca, dobrovoljni davaoci krvi 9,39%, trudnice 6,36%, a intravenski zavisnici od droga 1,21%.

Uzlazni trend nosilaštva, zastupljenost svih poznatih rizičnih grupa u populaciji obolelih u Nišavskom okrugu ukazuju na potrebu za poboljšanjem epidemiološkog nadzora, striktnom primenom zaštitnih mera, sprovođenja zakonom propisane vakcinacije svih kategorija lica izloženih posebnom riziku od infekcije kao i za kontinuiranom edukacijom o merama prevencije, kako stanovništva tako i pružalaca zdravstvenih usluga.

Ključne reči: epidemiologija, nosilaštvo, HBsAg, trend, vakcinacija