



Prevalence of Hepatitis B Serological Markers Among People Who Referred to a Great Laboratory in Neyshabur, Northeast of Iran

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Abstract

Background: Iran has been known as an area with low-intermediate prevalence for the hepatitis B virus (HBV) infection.

Objectives: This cross-sectional study was performed to assess the prevalence of serological markers and the potential risk factors of HBV infection among people who referred to the Neyshabur Lab of Academic Center for Education, Culture, and Research (ACECR), Razavi Khorasan Branch, northeast of Iran.

Methods: The 2669 serum samples were assessed to detect the hepatitis B surface antigen (HBsAg) by enzyme-linked immunosorbent assay (ELISA) during June 2015 to February 2016. In the case of HBsAg positive, hepatitis B e antigen (HBeAg), hepatitis B e antibody (HBeAb), total hepatitis B core antibody (anti-HBc), and IgM anti-HBc were evaluated. Moreover, demographic data and risk factors related to HBV infection were assessed.

Results: A total of 2099 (78.6%) females and 570 (21.4%) males with a mean age of 32.4 ± 13.1 years were enrolled. HBsAg seropositivity was observed in 90 (3.37%) individuals. ELISA tests for HBeAg, anti-HBe, total anti-HBc, and IgM anti-HBc were positive in 8 (8.9%), 75 (83.3%), 90 (100%), and 11(12.2%) of 90 HBsAg-positive cases, respectively. Age, sex, household size, and education level were significant risk factors for the infection.

Conclusions: Prevalence of HBV infection in Neyshabur could be considered as an intermediate level. Although some reasons for which individuals referred, were suggesting hepatitis.

Keywords: Hepatitis B, Epidemiology, Risk Factors, Iran

1. Background

Hepatitis B infection is one of the major and common liver infectious diseases worldwide (1). Importantly, there are globally 350 - 400 million chronic carriers of hepatitis B virus (HBV) (2). Routes of infection include vertical transmission (through childbirth), early life horizontal transmission (bites, lesions, and sanitary habits), and adult horizontal transmission (such as sexual contact and intravenous drug use) (3).

Indeed, the presence of the hepatitis B surface antigen (HBsAg) in serum is the first serum marker to indicate the HBV infection (4). Although, other HBV infection serological markers are hepatitis B e antigen (HBeAg) as well as antibodies against hepatitis B core (anti-HBc) and e (anti-HBe) antigens. These markers can be used for diagnosis and determining the severity of the infection (5).

The prevalence of HBV infection varies widely, with rates ranging from 0.1% to 20% through the worlds (6). Iran

has been known as an intermediate prevalence area of the infection i.e., 2% to 7% HBsAg seropositivity. The first estimate of the prevalence of HBV infection, about 30 years ago, indicated that approximately 35% of Iranians are exposed to HBV, and 3% are chronic carriers (7). However, a recent systematic review study cleared that HBV infection prevalence among Iranian general population is estimated as 2.14% (8).

Nonetheless, there are few data on the HBV seroprevalence and the related risk factors of hepatitis B among the general population in Northeastern Iran. A population-based study by Fathimoghaddam et al. (9), showed that the overall prevalence of HBsAg seropositivity in Mashhad is 1.4%; the prevalence among males and females were 2.0% and 0.9%, respectively. The infection was more prevalent in older and married persons and those with a history of traditional cupping.

2. Objectives

The present study aimed to evaluate the prevalence of serological markers and potential risk factors of HBV infection among individuals who referred to a great medical diagnostic center in Neyshabur, northeast of Iran.

3. Methods

This cross-sectional study was performed in the medical lab of the Academic Center for Education, Culture, and Research (ACECR) in Neyshabur. All persons who referred to test HBsAg seropositivity were enrolled. No specific criteria were considered to include in or exclude from the study. Totally, 2669 individuals were surveyed during June 2015 to February 2016.

After obtaining informed consent, all participants were interviewed in detail, and the data were recorded in a prescribed questionnaire. These included; age, gender, marital status, residence place, ethnicity, household size, education, income, and histories of blood transfusion, hospitalization, surgery, dentistry procedure, traditional cupping, and tattoos as well as the reasons of requesting HBsAg test.

The HBsAg was detected by enzyme-linked immunosorbent assay (ELISA) method (DSI s.r.l., Italy) and all reactive samples were analyzed to detect other markers of HBV infection, using ELISA commercial kits, according to manufacturers' companies. These included HBeAg, anti-HBe, total anti-HBc (Dia.pro, Italy), and IgM anti-HBc (General Biological Crop., Taiwan). This study was approved and supervised by a scientific board in ACECR, Razavi Khorasan Branch, regarding methodological and ethical issues (ACECR 93.48.1707).

Data were analyzed using the SPSS software ver.16.0 (SPSS, Chicago, IL) by chi-Square test. The $P < 0.05$ was considered statistically significant.

4. Results

The mean age of 2669 participants was 32.4 ± 13.1 years (Range: 1-93 years), of which 2099 (78.6%) were female, and 2431 (91.1%) were married. Nearly all participants (96.4%) were born in Neyshabur, and 2383 (89.3%) were from urban areas. Distribution of educational level was as follow: 163 (6.1%) illiterate, 392 (14.7%) primary school, 1516 (56.8%) secondary and high school, and 598 (22.4%) academic education.

Screening of HBV infection during pregnancy (51.2%) and routine medical check-up (29.4%) were the most common reasons for which the participants were referred to test serum HBsAg (Table 1).

Table 1. Reasons of Hepatitis B Surface Antigen Screening Among Individuals Referred to the ACECR Lab in Neyshabur (N = 2,669)

Reasons	No. (%)
During pregnancy	1368 (51.2)
Routine check up	784 (29.4)
Having some clinical or lab evidences suggesting hepatitis	320 (12.0)
Being candidate for a surgical operation	115 (4.3)
Having a positive family history of HBV infection	39 (1.5)
Visa application	43 (1.6)

4.1. Prevalence of HBsAg Positivity

A total of 90 cases with hepatitis B surface antigenemia (3.37%, CI 95%: 2.72 - 4.13) were detected. All cases with a positive HBsAg test had also a positive result for total anti-HBc test. Likewise, IgM anti-HBc, HBeAg, and anti-HBe markers were positive in 11 (12.22%), 8 (8.89%), and 75 (83.33%) individuals with HBsAg seropositivity, respectively (Table 2).

Expectedly, HBsAg seropositivity was more prevalent in people who referred because of having some clinical or lab evidences of hepatitis or in those with a positive family history of HBV infection (42/359; 11.70%) than pregnant women, candidates for an operation, individuals who requested a routine check-up, and those who applied a visa (48/2310; 2.08%) ($P < 0.001$).

4.2. Risk Factors of HBsAg Seropositivity

The data demonstrated a growing trend in the prevalence of HBV infection with increasing participant's age ($P < 0.0001$). Furthermore, gender ($P < 0.0001$), household size ($P < 0.0001$), and educational level ($P < 0.0001$) were significant demographic risk factors of HBsAg seropositivity (Table 3). On the other hand, HBsAg seropositivity were not associated with marital status, residence place, ethnicity, and income. As illustrated in Table 4, none of the risky procedures such as blood transfusion, hospitalization, surgery, dentistry procedure, traditional cupping, and tattooing had a significant association with HBsAg seroreactivity.

5. Discussion

Iran has been known as an endemic area of HBV infection with an intermediate level (2% - 7%) (10). The current study showed the same level of the infection prevalence (3.37%) in a non-random sample of the population from Neyshabur, northeast of Iran.

Among persons with HBsAg positivity, 8.9% showed HBeAg positivity that reflects active hepatitis and high infectivity. These patients are at increased risk of cirrhosis

Table 2. Hepatitis B Virus Serological Markers Among HBsAg Seropositive Persons, Neyshabur, Iran (N = 90)

HBV Serological Markers ^a	No. (%)	Interpretation
IgM anti-HBc(+), HBeAg(±), anti-HBe (±)	11 (12.22)	Recent hepatitis B infection
IgM anti-HBc (-), HBeAg (+), anti-HBe (-)	4 (4.44)	Chronic hepatitis B infection, high infectivity
IgM anti-HBc (-), HBeAg (-), anti-HBe (+)	73 (81.11)	Late acute or chronic hepatitis B, low infectivity/HBeAg-negative chronic hepatitis B infection
IgM anti-HBc (-), HBeAg (-), anti-HBe (-)	2 (2.22)	Unclear interpretation

^aTotal anti-HBc test was positive in all cases.

Table 3. Relation of HBsAg Seropositivity with Demographic Features in People Referred to the ACECR Lab in Neyshabur

Variable	No.	HBsAg-Positive Cases (%)	Odds Ratio (OR)	OR 95% CI	P Value
Age, y					< 0.0001
< 20	327	1 (0.3)	-	-	
20 - 29	1160	18 (1.55)	5.14	0.68 - 38.64	
30 - 39	666	22 (3.3)	11.14	1.49 - 82.99	
≥ 40	516	49 (9.5)	34.21	4.70 - 248.97	
Gender					< 0.0001
Male	570	46 (8.07)	4.10	2.68 - 6.27	
Female	2099	44 (2.1)			
Marital status					0.782
Single	229	7 (3.06)	0.90	0.41 - 1.96	
Married	2440	83 (3.4)			
Residence place					0.087
Rural	286	15 (5.24)	1.63	0.93 - 2.86	
Urban	2383	75 (3.15)			
Ethnicity					0.202
Fars	2583	85 (3.29)	0.55	0.22 - 1.40	
Others	86	5 (5.81)			
Household size					< 0.0001
≤ 2	983	13 (1.32)	3.57	1.97 - 6.46	
> 2	1686	77 (4.57)			
Education, y					< 0.0001
< 9	946	52 (5.50)	2.34	1.55 - 3.54	
≥ 9	1731	42 (2.4)			
Income (monthly), USD					0.101
< 300	2140	58 (2.71)	0.60	0.32 - 1.11	
≥ 300	529	32 (6.05)			

and hepatocellular carcinoma, which impose a heavy burden on the public health system (11).

Although this population is not representative for the general population, in the present study, the prevalence of HBV infection was considerably higher than that estimated among the general population of the country (2.14%) (8). The higher hepatitis B infection rate in our study is com-

pletely expected because a part of them had some clinical or lab evidence suggesting hepatitis, and some had a positive family history of HBV infection.

A study in 2011 showed the HBsAg positivity of 1.4% in Mashhad. HBsAg positivity among people with the risk factors of blood transfusion, hospitalization, surgery, dentistry procedure, traditional cupping, and tattooing were

Table 4. Relation of HBsAg Seropositivity with Risky Procedures in People Referred to the ACECR Lab in Neyshabur

Variable	No.	HBsAg-Positive Cases (%)	Odd Ratio (OR)	OR 95% CI	P Value
Blood transfusion					0.953
Yes	28	1 (3.57)	1.06	0.14 - 7.90	
No	2641	89 (3.37)			
Surgery					0.382
Yes	362	15 (4.14)	1.29	0.73 - 2.27	
No	2307	75 (3.25)			
Dentistry procedures					0.286
Yes	216	10 (4.63)	1.44	0.73 - 2.82	
No	2453	80 (3.26)			
Traditional cupping					0.958
Yes	145	5 (3.45)	1.02	0.41 - 2.58	
No	2524	85 (3.37)			
Hospitalization					0.155
Yes	343	16 (4.66)	1.49	0.86 - 2.59	
No	2326	74 (3.18)			
Tattooing					0.358
Yes	24	0 (0)	-	-	
No	2645	90 (3.40)			

3.17%, 1.28%, 1.63%, 2.59%, 3.77%, and 3.43%, respectively (9), while these amounts in our study were 3.57%, 4.14%, 4.63%, 3.45%, 4.66%, and 0%, respectively. It seems that HBsAg positivity among individuals with the risk factors of HBV infection, except tattooing, has a low percentage in Mashhad in comparison to ones in Neyshabur.

Furthermore, a survey in 2012 reported a much lower prevalence of HBV infection (0.75%) in Kermanshah, west of Iran. Predictors of HBsAg over multivariate analysis were old age, being male, history of tattooing, and history of the dental procedure (11). These results are in agreement with our study in terms of being aged and male, whilst other risk factors could not consider as a predictor of HBV infection.

Studies from some other countries present a higher rate of HBV infection. The adjusted seroprevalence of HBsAg in South Korea in 2009 was 4%. Similar to our study, HBsAg positivity was higher among older people (12). Additionally, the prevalence of HBsAg in young adults in Banjarmasin, Indonesia, was 4.6% (13). Furthermore, a comprehensive study in Singapore showed that the prevalence of HBsAg seropositivity was 3.6% in 2010 (14).

Our result cleared a significant relation between HBV infection and participant's age, gender, educational level, and household size. The HBsAg prevalence in young adults vaccinated against HBV as the first group of Iranian

neonates during 1993 and 1994 had investigated by Saffar et al., in 2014 (15). They found neither HBsAg positive nor symptomatic hepatitis cases. Similarly, Alavian et al. (11), showed that age and gender are major risk factors of HBV infection in Kermanshah province, west of Iran. Moreover, a population-based study in Mashhad reported a higher prevalence of HBsAg positivity among males than females and demonstrated a rising trend in the prevalence with an increase of participants' age (9). In addition, Merat et al. (16), showed that older age, high school education, and living in a rural area had a significant relation with HBV infection. On the other hand, Fathimoghaddam et al. (9), could not find any association between HBV infection and literacy and household size.

We have previously surveyed the HBsAg prevalence among people older than five years in Neyshabor between 2011 to 2015, in which the results demonstrated 4.11% of people suffer from HBV infection (17). Similar to the current report, there was a significant relationship between HBV infection and demographic factors of age and gender. In addition, we showed a higher prevalence in the previous five years in Neyshabur, which accordingly, we can claim the rate of infection decreased by the passage of time (17). Our another study (18), demonstrate that 1.09% of pregnant women were positive with HBsAg.

Based on the global hepatitis report, 2017, all countries

should seize the opportunities to eliminate viral hepatitis as a public health threat by 2030 (reducing new infections by 90% and mortality by 65%) (19). The Polaris Observatory (TPO) Collaborators estimate the global prevalence of HBsAg in the general population by a modeling study in 2016. This study has reported, corresponding to 292 millions infections, that the global prevalence of HBsAg in 2016 was 3.9% (20).

This survey could not show a significant relation between HBsAg positivity and some potential risky procedures and conditions such as blood transfusion, hospitalization, surgery, dentistry procedure, traditional cupping, and tattooing. Consequently, another study in Mashhad found no association between HBV infection and above-mentioned variables (except cupping) (9). In contrast, Alavian *et al.* (11), showed that the history of tattoo and dental procedures are important risk factors of HBsAg seropositivity in Kermanshah.

5.1. Conclusions

HBV infection prevalence in Neyshabur, northeast of Iran is considerably higher than that reported from several regions of the country. The higher hepatitis B infection rate in the current study is completely expected, due to the fact that some reasons for which individuals referred, were suggesting hepatitis. In spite of this fact, the implementing of efficient measures such as mass educational programs by local health authorities to control infection is strongly recommended.

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Footnotes

Authors' Contribution: Ali Akbar Moradian Evari and Mohammad Salehi performed the study and managed the manuscript preparation; also Mohammad Reza Hedayati-Moghaddam analyzed the data and revised the manuscript draft.

Conflict of Interests: The authors declare that they have no conflicts of interest relevant to the manuscript.

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