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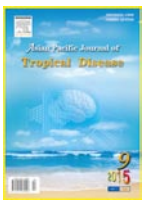

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Incidence rate of hepatitis B infection in provinces of Iran

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ABSTRACT

Objective: To investigate the epidemiological features and demographic characteristics of hepatitis B virus (HBV) infected patients and to estimate the province-specific incidence rates of HBV infection in Iran.

Methods: This retrospective study was conducted using the data provided by the National Hepatitis Registry database. According to the data registered at the database during 2010–2012, 28 227 persons were reported with confirmed positive HBV test results. Data were analyzed by SPSS 18 software using descriptive statistics to calculate the province-specific incidence of HBV infection according to age, sex and region of residence of the target populations.

Results: The incidence rate of HBV infection was lower than 15 per 100 000 inhabitants in four provinces. This rate was between 15/100 000–25/100 000 in 17 provinces and higher than 25/100 000 population in five provinces. The incidence rate of HBV infection was highest in Yazd and lowest in Gilan Provinces. In most provinces, the incidence rate of hepatitis B among men was higher than women. In all provinces, the incidence of hepatitis B was lowest in the under 10-year-old group and highest in the 60–69-year-old group.

Conclusions: Considering the large number of population at risk, hepatitis B prevention policies should focus on persons aged 20–49 years, with an emphasis on health education programs regarding the routes of exposure to HBV as well as vaccination of the high risk groups.

1. Introduction

More than two billion people have serological evidence of past or present infection with hepatitis B virus (HBV) worldwide[1-3]. In all countries of Eastern Mediterranean region of the World Health Organization, hepatitis B infection is endemic[2].

i.e. the Middle East region falls into the intermediate range of HBV prevalence with 2%–4% of infected population almost 4.3 million people are infected with HBV annually[2,4,5].

The prevalence of HBV surface antigen in Iranian people is estimated to be 2.6%[6]. According to the World Health Organization and the Centers for Disease Control and Prevention, Iran ranks intermediate prevalence of HBV infection among the world countries[7,8]. It seems that 35% of Iranians have a risk of HBV exposure and 2%-3% of them are chronic carriers of HBV[8].

The distribution of infection across different areas of the country varies considerably. For example, the figure in some parts of the country, such as Fars Province, is 1.7% while, in Sistan and Baluchistan Province, it is around 5%[9]. Some studies have shown that HBV chronic infection is responsible for approximately 75% of cases of cirrhosis and hepatocellular carcinoma in Iran and the Middle East[2,8].

Based on the National Population and Housing Census conducted in 2011, Iran has 31 provinces and the population of the country was 75 149 669 with 21 446 783 (28.5%) people lived in rural areas, 53 646 661 (71.4%) resided in urban areas and 22 556 were non-resident[10]. Since 2004, the Ministry of Health and Medical Education of Iran established the HBV infection registry and all provinces participated in this national program[11,12]. The aim of this surveillance system is to provide a reliable monitoring system to control hepatitis B. However, no specific time has been set to achieve this goal[13]. No study has yet been conducted regarding the epidemiology of hepatitis

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B using the data on all registered HBV infected Iranian cases.

The aim of this study was to investigate the epidemiological features and demographic characteristics of HBV infected patients and to estimate province-specific incidence rates of HBV infection in Iran, according to the data provided by the National Hepatitis Registry during 2010-2012.

2. Materials and methods

This retrospective study was conducted using the data provided by the National Hepatitis Registry database. According to this surveillance system, each case of confirmed HBV infection has to be reported and all of the demographic data on infected cases should be recorded systematically throughout the country. Under these regulations, blood transfusion organization, all public and private laboratories, hospitals and medical centers should report the diagnosed cases to their City Health Department (Markaz Behdasht Shahrestan). To ensure the accuracy of the records, in the urban or rural health centers, a registered physician confirms the collected data[12]. The information is recorded in a questionnaire provided by the Hepatitis Prevention and Control Office at the Communicable Diseases Management Center of the Iranian Ministry of Health and Medical Education.

According to the registered data at the National Hepatitis Database during 2010-2012, the sample size of this research was 28 227 individuals with confirmed positive HBV rest results. All identified patients with HBV infection during the period whose records were complete and accessible were included.

Given the secondary analysis of a registry data, the ethics approval was not necessary. Data were analyzed by SPSS V.18 software using descriptive statistics to calculate the province-specific incidence of hepatitis B infection according to the age, sex and region of residence of each infected case.

To estimate the population at risk for calculating the incidence rate, all vaccinated individuals under twenty years old were subtracted. The infected persons were ignored, as they comprised a relatively small percentage of the general population.

3. Results

The present study analyzed the data on all diagnosed HBV infected cases provided by the National Hepatitis Database during 2010-2012, consisted of approximately 28 227 people.

The incidence rate of hepatitis B infection according to the provincial population in the southern provinces (Bushehr, Khuzestan, Sistan and Baluchestan, Fars, Kerman and Hormozgan) was highest in Sistan and Baluchestan and lowest in Busher Province, with 23.06 per 100 000 and 7.55 per 100 000 inhabitants infected, respectively. In Eastern Iran, the rate was highest in North Khorasan (25.89 per 100 000) and lowest in South Khorasan (18.15 per 100 000 population). In Northern provinces (Ardebil, Golestan, Gilan and Mazandaran), the rate was highest in Mazandaran and lowest in Gilan Province with 31.55 per 100 000 and

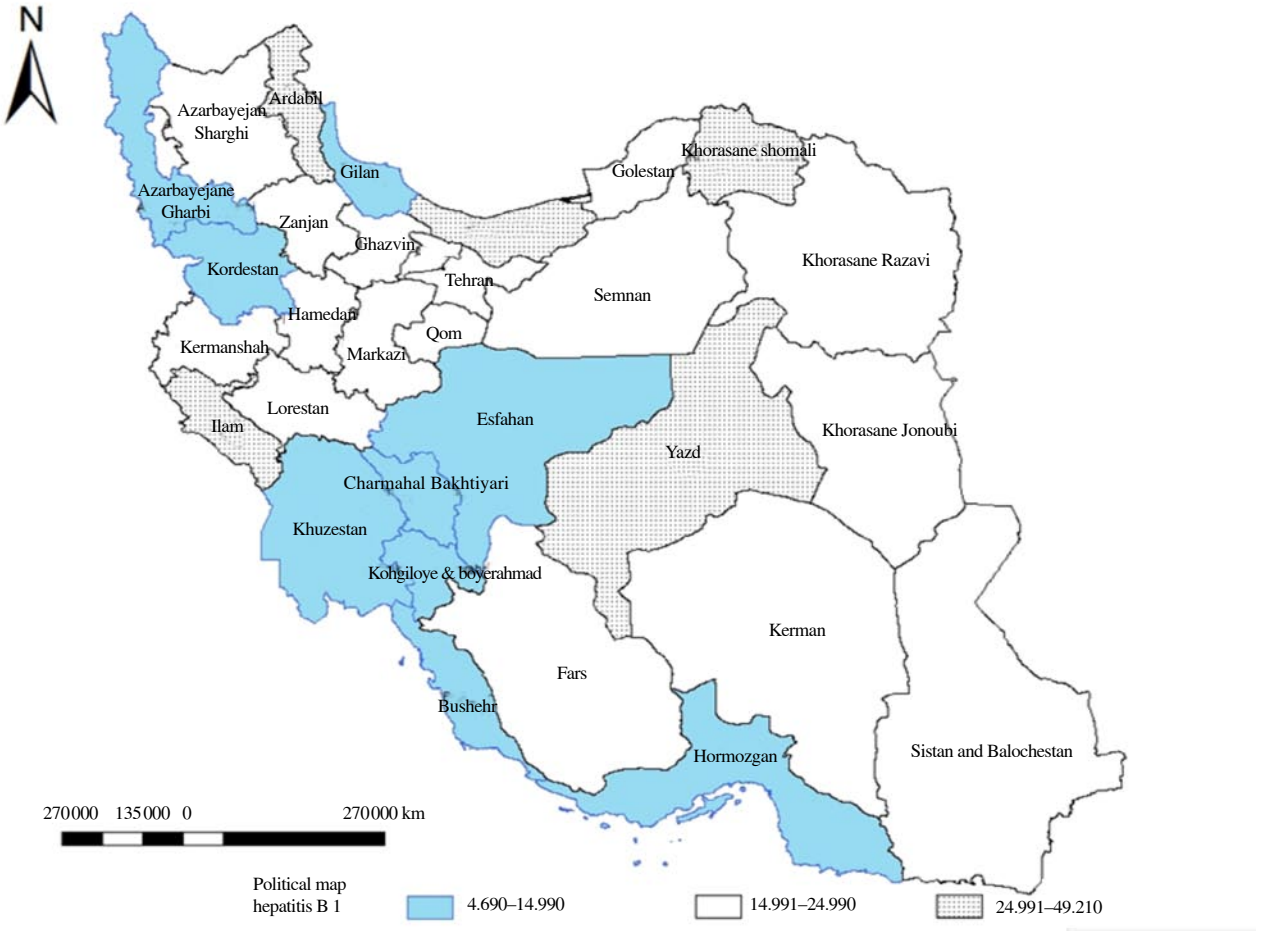

Figure 1. Provincial incidence rate of HBV infection per 100 000 population in Islamic Republic Iran provinces, 2010-2012.

4.69 per 100000 population, respectively. The lowest incidence rate among the western provinces (East Azerbaijan, West Azerbaijan, Elam, Charmahal Bakhtiari, Zanjan, Kurdistan, Kohgiluyeh & Boyer-Ahmad, Lorestan and Hamedan) was observed in Kurdistan was 10.01 per 100000 and the highest rate was observed in Elam was 25.72 per 100000 population. Finally, in central of provinces (Isfahan, Tehran, Semnan, Qazvin, Qom, Markazi, Yazd and Alborz Provinces), the rate was highest in Yazd and lowest in Isfahan with 49.21 per 100000 and 10. 33 per 100000 population, respectively (Figure 1).

The incidence rate of HBV infection was lower than 15 per 100000 inhabitants in 4 provinces. This rate was between 15-25 per 100000 in 17 and higher than 25 per 100000 population in 5 provinces. In most provinces, the incidence rate of hepatitis B among men was higher than women. The rate was higher among women in thirty-one provinces. The maximum difference in female to male incidence rate was noted in Golestan, Kerman, Razavi Khorasan Provinces and the maximum difference in male to female incidence rate was observed in Mazandaran, North Khorasan, and Ardebil Provinces. There was no gender difference in the highest and the lowest incidence rate of HBV infection in Yazd and Gilan Provinces, respectively (Figures 2 and 3).

In this study, the overall incidence of hepatitis B in urban areas was higher than in rural areas. However, it was higher in the rural regions in 15 provinces. The maximum difference in rural to urban areas incidence rate was detected in Golestan and Yazd, and the maximum difference in urban to rural areas rate was observed in Ardebil and North Khorasan Provinces.

There was no difference in the highest and the lowest incidence rate of HBV infection in Yazd and Gilan Provinces, regarding the geographic distribution of inhabitants (Table 1).

Table 1
Incidence rate of HBV infection per 100000 population according to age and region of residence in Islamic Republic Iran provinces, 2010–2012.

Province**	Incidence rate*		Age (mean ± SD)
	Urban	Rural	
East Azerbaijan	20.71	24.58	38.1 ± 15.0
West Azerbaijan	14.70	10.33	41.8 ± 15.0
Ardabil	29.23	14.99	37.9 ± 14.0
Esfahan	9.30	9.74	37.3 ± 15.0
Alborz	14.92	19.98	40.4 ± 14.0
Elam	26.63	18.03	39.1 ± 15.0
Bushehr	7.04	7.55	36.0 ± 14.0
Tehran	20.27	15.88	43.5 ± 16.0
Chahar Mahal-o-Bakhtiari	7.40	13.04	41.1 ± 18.0
South Khorasan	17.57	15.78	39.5 ± 15.0
Razavi Khorasan	18.12	20.12	38.9 ± 14.0
North Khorasan	31.81	16.00	40.8 ± 15.0
Khuzestan	7.31	11.08	37.5 ± 15.0
Zanjan	13.58	15.20	44.9 ± 18.0
Semnan	19.81	23.74	37.7 ± 14.0
Sistan and Baluchestan	20.80	22.70	29.2 ± 11.0
Fars	17.72	12.79	36.6 ± 16.0
Qazvin	16.15	12.84	46.1 ± 18.0
Qom	23.45	25.93	46.1 ± 18.0
Kurdistan	10.49	6.22	34.7 ± 14.0
Kerman	15.98	23.01	33.7 ± 14.0
Kermanshah	17.61	15.94	37.8 ± 14.0
Kohgiloye and Boyer Ahmad	15.14	12.21	40.9 ± 15.0
Golestan	11.02	26.80	34.1 ± 12.0
Gillan	4.49	4.15	47.6 ± 17.0
Lorestan	20.14	13.87	35.6 ± 14.0
Mazandaran	33.29	23.84	39.5 ± 15.0
Markazi	15.99	16.03	40.0 ± 16.0
Hormozgan	12.57	5.11	34.5 ± 13.0
Hamedan	17.41	13.35	42.9 ± 16.0
Yazd	43.82	52.78	37.0 ± 14.0

*: Per 10^5 population; **: Corresponds to the relevant universities of medical sciences.

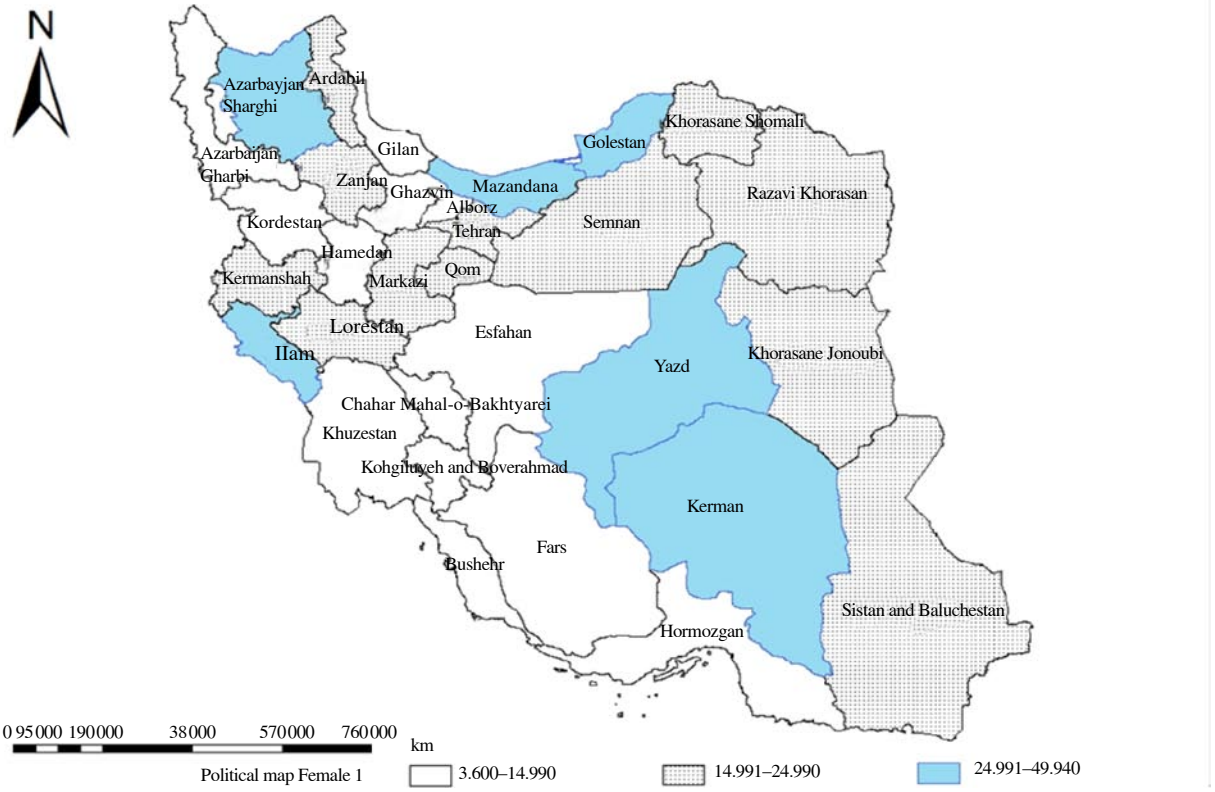

Figure 2. Provincial incidence rate of HBV infection per 100000 population among women in Islamic Republic of Iran, 2010–2012.

Figure 3. Provincial incidence rate of HBV infection per 100 000 population among men in Islamic Republic Iran, 2010-2012.

The median age of the infected cases was under 30 years old only in the Kerman Province. The mean age was higher in 12 provinces (over 40 years) and six of them located in centre of Iran (Table 1).

In all provinces, the incidence of hepatitis B from the lowest to the highest was noted in under ten-years, 10–19, 20–29, 30–39, 40–49, 50–59, 60–69 and above 70 years age groups, respectively. The lowest incidence of hepatitis B in under ten–years age group noted in Alborz, North Khorasan, Zanjan, Semnan, Qom, Kohgiluyeh and Boyer–Ahmad Provinces and the highest rate was observed in Yazd Province. The incidence rate of hepatitis B in the age groups 10–19 years, 20–29 years, 30–39 years, 40–49 years and 50–59 years was lowest in Gilan Province and highest in Yazd Province. The lowest incidence of hepatitis B in the age group 60–69 years and above 70–years observed in Sistan and Baluchestan and Golestan Provinces, respectively. Qom Province had the highest incidence rate of HBV infection in the two age groups. Regarding the age-related incidence rate of HBV infection, the highest rate was reported in the 60–69 years old group in Qom Province. While, the lowest rate was detected in less than 10 years old group in Alborz, North Khorasan, Zanjan, Semnan, Qom, Kohgiluyeh and Boyer Ahmad Provinces (Table 2).

In nearly all provinces, the clinics had the lowest proportion of reported HBV infected cases and the highest participation was noted from the private clinics, Blood Transfusion Organization, hospitals, laboratories and health centers, respectively. The minimum and maximum percentages of disease reporting through health centers were in Kurdistan and Kermanshah Provinces respectively. The minimum percentage of reporting through Blood Transfusion Organization was reported from South Khorasan and Qom Provinces and the maximum percentage was reported from Ardebil Province. The minimum percentage of reporting through clinics belonged to Elam, Bushehr, Charmahal and Bakhtiari and Zanjan Provinces, respectively. While, the maximum percentage of reporting through clinics was in Qazvin Province. The minimum and maximum percentages of disease reporting through private clinics were in Kermanshah and West Azerbaijan Provinces. The minimum and maximum percentages of reporting through hospitals were in Gulistan, Qom and Kermanshah Provinces. Qom and Mazandaran had the minimum and maximum percentages of reporting through laboratories, respectively (Table 3).

Considering the coverage of vaccination for HBV, it was found that less than 20% of general population had been fully vaccinated (Table 3).

Table 2
The incidence rate* of HBV infection per 100 000 population according to age groups in Islamic Republic of Iran provinces, 2010–2012.

Province**	< 10 years	10–19 years	20–29 years	30–39 years	40–49 years	50–59 years	60–69 years	> 70 years
East Azerbaijan	0.89	2.71	20.66	24.35	18.46	20.17	20.12	12.19
West Azerbaijan	0.25	1.03	8.19	13.40	15.17	18.48	18.06	12.35
Ardabil	0.69	3.82	21.78	26.08	23.11	26.49	20.45	15.90
Esfahan	0.58	2.15	8.90	9.70	7.82	8.09	8.25	9.47
Alborz	0.00	2.23	12.32	13.64	15.16	17.55	26.34	18.25
Elam	0.78	1.76	16.72	28.46	21.32	26.28	35.06	20.94
Bushehr	0.19	1.29	6.70	6.85	6.67	7.02	7.27	5.61
Tehran	0.25	2.61	13.20	17.10	15.66	22.91	40.13	36.55
Chahar Mahal-o-Bakhtiari	0.43	1.48	7.69	8.60	6.51	13.83	11.81	15.33
South Khorasan	0.54	1.06	13.02	19.00	23.12	18.44	9.36	11.80
Razavi Khorasan	0.29	2.24	16.21	19.56	17.11	16.37	18.36	13.39
North Khorasan	0.00	2.01	16.09	28.45	29.72	23.48	32.56	20.56
Khuzestan	0.29	1.61	6.13	7.96	9.45	8.13	9.73	10.32
Zanjan	0.00	1.17	10.26	11.98	9.81	17.77	28.07	28.31
Semnan	0.00	2.06	19.36	26.42	18.23	24.86	13.65	9.68
Sistan and Baluchestan	1.23	4.41	29.27	16.05	11.91	6.15	4.80	6.96
Fars	0.48	3.85	13.03	14.36	15.31	16.29	13.01	10.56
Qazvin	0.18	1.75	13.36	15.94	11.32	18.36	8.58	26.35
Qom	0.00	2.29	13.43	18.63	18.00	34.27	65.03	60.26
Kurdistan	0.14	0.26	4.74	7.49	9.84	16.89	18.04	10.70
Kerman	1.50	5.88	17.93	20.24	12.53	13.86	15.58	10.85
Kermanshah	0.24	2.76	17.06	16.16	16.53	18.51	13.20	10.46
Kohgiloye Boyer Ahmad	0.00	2.20	8.57	11.99	18.99	18.23	22.48	13.59
Golestan	0.54	3.53	21.44	17.34	16.34	15.48	11.28	3.63
Gillan	0.11	0.18	3.33	2.84	3.86	5.47	6.57	8.84
Lorestan	0.24	3.61	18.80	16.43	15.45	12.37	14.94	11.01
Mazandaran	0.59	4.58	26.83	30.87	27.72	31.27	27.98	16.52
Markazi	0.16	3.82	15.34	11.86	16.09	19.55	15.18	14.61
Hormozgan	0.22	1.33	8.73	9.31	8.21	7.17	5.58	4.96
Hamedan	0.26	1.94	10.31	13.38	18.40	23.88	22.13	14.67
Yazd	2.13	7.53	38.16	47.06	44.42	42.92	39.83	19.49

*: Per 10^5 population; **: Corresponds to the relevant universities of medical sciences.

Table 3
Source of HBV data and vaccination history of HBV infected cases in Islamic Republic of Iran provinces, 2010–2012 (%).

Province	Lab	Hospital	Office	Blood Transfusion Organization	Clinic	Health Center	Vaccination	
							No	Yes
East Azerbaijan	0.398	0.142	0.031	0.104	0.004	0.322	0.87	0.13
West Azerbaijan	0.177	0.128	0.334	0.036	0.033	0.292	0.92	0.08
Ardabil	0.143	0.051	0.092	0.439	0.002	0.274	0.90	0.10
Esfahan	0.078	0.327	0.036	0.065	0.004	0.490	0.85	0.15
Elam	0.320	0.056	0.011	0.026	0.000	0.587	0.78	0.22
Bushehr	0.161	0.101	0.007	0.322	0.000	0.409	0.86	0.14
Tehran	0.089	0.607	0.006	0.014	0.013	0.270	0.91	0.09
Chahar Mahal-o-Bakhtiari	0.500	0.095	0.006	0.173	0.000	0.226	0.94	0.06
South Khorasan	0.278	0.098	0.302	0.000	0.005	0.317	0.82	0.18
Razavi Khorasan	0.120	0.192	0.041	0.006	0.009	0.632	0.91	0.09
North Khorasan	0.141	0.207	0.239	0.083	0.040	0.290	0.88	0.12
Khuzestan	0.316	0.139	0.031	0.048	0.016	0.450	0.79	0.21
Zanjan	0.068	0.491	0.014	0.031	0.000	0.396	0.92	0.08
Semnan	0.115	0.090	0.054	0.155	0.029	0.558	0.93	0.07
Sistan and Baluchestan	0.127	0.096	0.022	0.011	0.004	0.741	0.81	0.19
Fars	0.254	0.106	0.038	0.403	0.018	0.181	0.87	0.13
Qazvin	0.114	0.179	0.114	0.117	0.179	0.296	0.90	0.10
Qom	0.000	0.683	0.002	0.000	0.012	0.303	0.86	0.14
Kurdistan	0.253	0.198	0.084	0.282	0.055	0.128	0.77	0.23
Kerman	0.538	0.145	0.039	0.014	0.009	0.255	0.77	0.23
Kermanshah	0.116	0.050	0.001	0.026	0.001	0.805	0.81	0.19
Kohgiloye Boyer Ahmad	0.364	0.052	0.121	0.040	0.040	0.382	0.88	0.12
Golestan	0.312	0.031	0.022	0.028	0.002	0.605	0.76	0.24
Gillan	0.097	0.134	0.118	0.017	0.004	0.630	0.87	0.13
Lorestan	0.285	0.033	0.049	0.075	0.014	0.544	0.85	0.15
Mazandaran	0.664	0.094	0.026	0.054	0.004	0.159	0.88	0.12
Markazi	0.184	0.144	0.326	0.038	0.011	0.298	0.89	0.11
Hormozgan	0.071	0.245	0.134	0.059	0.170	0.320	0.90	0.10
Hamedan	0.633	0.096	0.020	0.087	0.007	0.157	0.87	0.13
Yazd	0.221	0.087	0.021	0.098	0.015	0.559	0.84	0.16
Alborz	0.394	0.230	0.029	0.070	0.027	0.251	0.86	0.14

4. Discussion

This study reported the epidemiological aspects of all detected and registered hepatitis B surface antigen positive individuals throughout the country aiming to calculate the incidence rate of the infection with respect to age groups, gender, region of residence, data resources and the history of receiving HBV vaccination during 2010–2012. Given that the previous relevant studies in Iran either focused on the special groups with small sample size or incidence rate of the infection with respect to selected parameters, their results are not comparable with the results of this study[11,14-17].

Concerning the prevalence rate of HBV infection in different age groups, more than 67% of them were aged between 20–49 years old. This sounds reasonable, given that this age group is more participated in social activities, occupational exposures, substance abuse and sexual activities.

As previously mentioned, the highest and the lowest incidence rate of HBV infection was noted in Yazd and Gilan Provinces, respectively. The likely reason of this high incidence rate in Yazd Province can be the age pyramid with a larger proportion of young population, as well as the constant entrance of the emigrant workers, a population at risk, from neighboring provinces and southern Iran to this province. It is worth mentionening that drug addiction is an important risk factor for acquiring HBV infection. While, 2.65% of Iranian general population are drug addicts, this rate rises to 4% in Yazd Province[18,19]. On the other hand, the low number of people at risk in Gilan may explain the low incidence rate of HBV infection in this province.

In all provinces, the public clinics had the lowest proportion of reported HBV infection, and the highest participation was noted from the private clinics, Blood Transfusion Organization, hospitals, laboratories and Health Centers, respectively. Apparently, governmental organizations had a more prominent role in detecting and reporting the cases, so that the health centers that are the most widespread governmental organizations even in remote rural areas and nomadic regions, had the highest proportion of reported infection.

The incidence rate of hepatitis B in general was higher among men and in urban areas. This finding is supported by a systematic review by Alavian *et al*.[15] and another study by Khameneh *et al*.[6]. More engagement in social activities and greater risk of occupational exposures to the virus may explain this higher incidence rate.

In the present study, the lowest incidence rate of HBV infection was noted in the age group below 20 years old that increased with aging (except for people over 70 years old) in all provinces. The likely reason is that the risk and cumulative frequency of high risk behaviors increase with age and consequently the likelihood of HBV infection increases[16,20,21]. Hepatitis B vaccination has been a part of the expanded program on immunization of Iran since 1993, with 98% coverage[22]. Children born thereafter were vaccinated against HBV and the incidence rate of infection among them has been decreased remarkably. As the results show, after 20 years of national vaccination program, the lowest incidence rate of infection is noted in this age group.

This study showed that more than 80% of infected cases did not have a history of hepatitis B vaccination, as indicated in some other studies[11,14,23].

The results emphasize the importance of vaccination to prevent hepatitis B infection and reduce the incidence rate of HBV in general population. The highest incidence is seen in the age groups above 20 years, who are more susceptible to the infection due to more engaging in social activities, higher risk of occupation or other types of exposures and not receiving hepatitis B vaccine. Universal vaccination of all neonates against HBV reduce the infection significantly and it appears to be the reason for increasing the mean age of the patient[17,24].

In a study conducted by Asl *et al*. on a group of Gypsies, the mean age for HBV seropositivity was 20.7 years[25]. The communities of Gypsies are characterized by pervasive social health problems, widespread poverty, limited educational opportunities and no vaccination. This lower age for acquiring HBV infection emphasizes the importance of vaccination in early life, as stated before.

As previously mentioned, the mean age of the infected cases was 29 ± 11 years old in Sistan and Baluchestan Provinces. It was above 40 years old in 11 provinces and below 40 in the other provinces. One reason may be the greater number of people at risk in these age groups.

Age group of 20–49 years constitutes approximately 51% of the Iranian population. Given that this age group is more susceptible to hepatitis B infection compared with the other age groups, a large proportion of total number of hepatitis B cases was noted in this age group.

It is noteworthy that the incidence of HBV infection has been remarkably decreased in people below 20 years of age, 32% of the total population, because they were vaccinated at birth.

The major limitation of this study was the inadequacy of the data reported to the National Hepatitis B Registry. Despite being mandatory, reporting of identified HBV infected cases by clinics and organizations, especially in the private sector, is far from complete[12]. Therefore, the results may under estimate the actual number of HBV infected cases in the community. Further, we included the recently diagnosed cases as the new cases to calculate the incidence rate. So, the results may be a little bit overestimated.

Considering the greatest number of population at risk, hepatitis B prevention policies in Iran should focus on persons aged 20–49 years, with an emphasis on health education programs regarding the routes of exposure to HBV as well as vaccination of the high risk groups. Given that the current status of reporting of newly detected HBV infected cases is less than adequate by the private sector, national policies should address this shortcoming.

The results of this study can be used in planning for the management and control of HBV infection in Iran and neighboring countries in the Middle East.

Conflict of interest statement

We declare that we have no conflict of interest.

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References

[1] Saffar H, Ajami A, Saffar MJ, Shojaei J, Sotudeh-Anvari M, Shams-Esfandabad K, et al. Prevalence of hepatitis B virus seromarkers in young adults vaccinated at birth; impact on the epidemiology of hepatitis B infection in Iran. *Hepat Mon* 2014; **14**(5): e17263.

[2] World Health Organization. The growing threats of hepatitis B and C in the Eastern Mediterranean Region: a call for action. Geneva: World Health Organization; 2009. [Online] Available from: http://applications.emro.who.int/docs/EM_RC56_3_en.pdf [Accessed on 11th December, 2014].

[3] Thabit AM, Al-Moyed KA, Al-Balushi MS, Hasson SS, Sallam TA. Occult hepatitis B virus among chronic liver disease patients in Yemen. *Asian Pac J Trop Dis* 2012; **2**(1): 4-6.

[4] Ott JJ, Stevens GA, Groeger J, Wiersma ST. Global epidemiology of hepatitis B virus infection: new estimates of age-specific HBsAg seroprevalence and endemicity. *Vaccine* 2012; **30**(12): 2212-9.

[5] Hatzakis A, Van Damme P, Alcorn K, Gore C, Benazzouz M, Berkane S, et al. The state of hepatitis B and C in the Mediterranean and Balkan countries: report from a summit conference. *J Viral Hepat* 2013; **20**(Suppl 2): 1-20.

[6] Khameneh ZR, Sepehrvand N. Survey of hepatitis B status in hemodialysis patients in a training hospital in Urmia, Iran. *Saudi J Kidney Dis Transpl* 2008; **19**(3): 466-9.

[7] Rein DB, Stevens GA, Theaker J, Wittenborn JS, Wiersma ST. The global burden of hepatitis E virus genotypes 1 and 2 in 2005. *Hepatology* 2012; **55**(4): 988-97.

[8] Merat S, Rezvan H, Nouraie M, Jamali A, Assari S, Abolghasemi H, et al. The prevalence of hepatitis B surface antigen and anti-hepatitis B core antibody in Iran: a population-based study. *Arch Iran Med* 2009; **12**(3): 225-31.

[9] Moosazadeh M, Amiresmaili MR, Nezammahalleh A. [The epidemiology of HBsAg positive cases reported to the Health Deputy of Mazandaran University of Medical Sciences, Iran]. *J Health Dev* 2012; **1**(2): 130-7. Persian.

[10] Statistical Centre of Iran. Statistical pocketbook of the Islamic Republic of Iran 1390 (March 2011- March 2012) No. 28. Tehran: Statistical Centre of Iran; 2012. [Online] Available from: http://www.amar.org.ir/Portals/1/releases/Iran_Statistical_Pocket_book_90.pdf [Accessed on 21st January, 2013].

[11] Poorolajal J, Mirzaei M, Bathaei SJ, Majzoobi MM. Hepatitis B and C infections in Hamadan Province during 2004-2009. *J Res Health Sci* 2011; **11**(1): 51-7.

[12] Asgari F, Haghazali M, Esteghamati A, Haj Rasooliha H. [*Hepatitis B surveillance guideline*]. Tehran: MOHME; 2007. Persian.

[13] World Health Organization. Global policy report on the prevention and control of viral hepatitis in WHO Member States. Geneva: World Health Organization; 2013. [Online] Available from: http://www.who.int/csr/disease/hepatitis/global_report/en/ [Accessed on 21st January, 2014]

[14] Ghadir MR, Belbasi M, Heidari A, Jandagh M, Ahmadi I, Habibinejad H, et al. Distribution and risk factors of hepatitis B virus infection in the general population of Central Iran. *Hepat Mon* 2012; **12**(2): 112-7.

[15] Alavian SM, Hajarizadeh B, Ahmadzad-Asl M, Kabir A, Bagheri-Lankarani K. Hepatitis B virus infection in Iran: a systematic review. *Hepat Mon* 2008; **8**(4): 281-94.

[16] Salehi M, Alavian SM, Tabatabaei SV, Izadi Sh, Moghaddam ES, Kafi-Abad SA, et al. Seroepidemiology of HBV infection in South-East of Iran; a population based study. *Iran Red Crescent Med J* 2012; **14**(5): 283-8.

[17] Saffar H, Ajami A, Saffar MJ, Shojaei J, Sotudeh-Anvari M, Shams-Esfandabad K, et al. Prevalence of hepatitis B virus seromarkers in young adults vaccinated at birth; impact on the epidemiology of hepatitis B infection in Iran. *Hepat Mon* 2014; **14**(5): e17263.

[18] Dehghani KH, Zare A, Dehghani H, Sedghi H, Poormovahed Z. Drug abuse prevalence and risk factors in students of Shaheed Sadoughi University of Medical Sciences, Yazd. *J Shahid Sadoughi Univ Med Sci* 2010; **18**(3): 164-9.

[19] [40 thousand addicts in Yazd]. Tehran: Mehr News Agency; 2014. [Online] Available from: http://www.mehrnews.com/detail/News/2318919 [Accessed on 9th November, 2014] Persian.

[20] Alavian SM, Tabatabaei SV, Ghadimi T, Beedrapour F, Kafi-Abad SA, Gharehbaghian A, et al. Seroprevalence of hepatitis B virus infection and its risk factors in the west of Iran: a population-based study. *Int J Prev Med* 2012; **3**(11): 770-5.

[21] Shakeri MT, Foghanian B, Nomani H, Ghayour-Mobarhan M, Nabavinia MS, Rostami S, et al. The prevalence of hepatitis B virus infection in Mashhad, Iran: a population-based study. *Iran Red Crescent Med J* 2013; **15**(3): 245-8.

[22] National Committee on Immunization. Vaccination and immunity guideline. Tehran: Centre for Communicable Disease Control, MOHME; 2009. [Online] Available from: http://www.behdasht.gov.ir/uploads/imansazi1_9174.pdf [Accessed 12th April 2015]

[23] Mirzaei M, Afzali M, Lotfi MH, Alavinia SM, Fallahzadeh MH, Ayatollahi J. Hepatitis B infection in North Khorasan Province during March 2010-February 2012. *J N Khorasan Univ Med Sci* 2014; **6**(2): 432-9.

[24] Daw MA, El-Bouzedi A, In association with Libyan Study Group of Hepatitis & HIV. Prevalence of hepatitis B and hepatitis C infection in Libya: results from a national population based survey. *BMC Infect Dis* 2014; **14**: 17.

[25] Asl SKH, Avijgan M, Mohamadnejad M. High prevalence of HBV, HCV, and HIV infections in Gypsy population residing in Shahr-e-Kord. *Arch Iran Med* 2004; **7**(1): 20-2.