

# Epidemiological Characteristics of Hepatitis B in Harbin from 2010 to 2023

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**Abstract:** *Objective:* To analyze the distribution characteristics and trends of hepatitis B in Harbin and provide evidence for the development of hepatitis B prevention and control strategies. *Methods:* Descriptive epidemiological methods were used to analyze the three-dimensional distribution characteristics and epidemiological trends of hepatitis B data in Harbin from 2010 to 2023. *Results:* A total of 38,604 cases of hepatitis B were reported in Harbin from 2010 to 2023, with an average annual incidence rate of 26.38 per 100,000. The majority of hepatitis B cases were chronic. There was no obvious seasonal distribution pattern of hepatitis B. The average incidence rate was lowest in the < 10-year-old group (1.72 per 100,000) and highest in the 40-year-old group (34.71 per 100,000). Cases were mainly concentrated in the 30-69-year-old population, accounting for 75.35%. The male-to-female ratio was 1.35:1. The majority of cases were farmers, accounting for 57.31%. *Conclusion:* Except for a significant decrease from 2020 to 2022, the overall incidence of hepatitis B showed a trend of decreasing first and then increasing from 2010 to 2023. The prevention and control measures for the 0-19-year-old population were effective. It is necessary to strengthen the prevention and control of hepatitis B among adults over 20 years old, especially to develop differentiated hepatitis B prevention and control strategies targeting key areas and high-risk populations.

**Keywords:** Hepatitis B virus; Epidemiological characteristics; Hepatitis B vaccine

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## 1. Introduction

Hepatitis B, commonly known as hepatitis B, is a disease caused by the hepatitis B virus (HBV). It is mainly transmitted through blood and blood products, mother-to-child transmission, damaged skin and mucous membranes, and sexual contact. It is a statutory category B infectious disease in China. Common symptoms include fatigue, loss of appetite, aversion to oil, and abnormal liver function. Some patients may also experience symptoms such as jaundice and fever. The main treatment methods include antiviral therapy, immunomodulation, anti-inflammatory therapy, and symptomatic treatment. Liver transplantation may be considered if necessary. HBV

infection has become one of the major global public health problems <sup>[1]</sup>. In 2016, the WHO proposed a strategic goal to eliminate viral hepatitis by 2030 <sup>[2]</sup>. After the promotion and use of the hepatitis B vaccine (HBV) in China in 1992, the incidence rate has dropped significantly. However, according to the National Health Commission, there are still 28 million chronic hepatitis B patients in China, and the task of preventing and treating hepatitis B in China remains severe, with a heavy disease burden <sup>[3, 4]</sup>. To understand the epidemiological characteristics and trends of hepatitis B in terms of time, region, and population in Harbin, and to accumulate data for the development of effective hepatitis B prevention and control strategies, this article analyzes the epidemiological characteristics of hepatitis B in Harbin from 2010 to 2023.

## **2. Materials and methods**

### **2.1. Data source**

Data on hepatitis B incidence and deaths from 2010 to 2023 are obtained from the “Infectious Disease Monitoring” module in the business application of the China Disease Prevention and Control Information System.

### **2.2. Case query conditions**

Cases are queried based on current residential address, date of onset, and case diagnosis status, including acute, chronic, and unclassified.

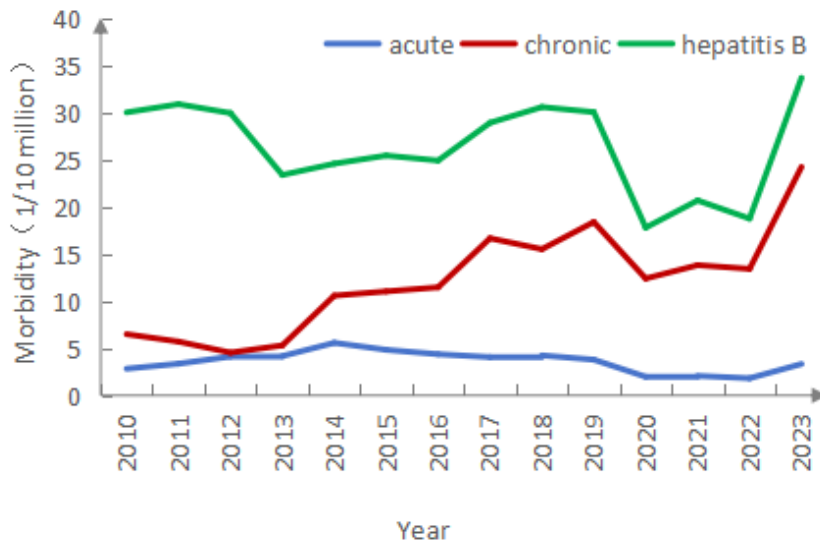
### **2.3. Statistical analysis**

Descriptive analytical methods are used to analyze indicators such as incidence rate, number of cases, mortality rate, number of deaths, and proportion. SPSS 19.0 and Excel 2013 are used for statistical analysis.

## **3. Results**

### **3.1. Epidemiological overview**

From 2010 to 2023, a total of 38,604 cases of hepatitis B were reported in Harbin, with an average annual incidence rate of 26.38 per 100,000. The majority of cases were chronic hepatitis B. There were 98 deaths reported, with an average annual mortality rate of 0.06 per 100,000. The incidence of hepatitis B showed an atypical “W”-shaped fluctuation, with an initial decrease from 2013 to 2014 followed by an increase. However, it dropped to a lower level of 17.77 per 100,000 from 2020 to 2022 and finally rose to a peak of 33.64 per 100,000 in 2023. The overall trend of acute hepatitis B showed a decline, while chronic hepatitis B followed a similar trend to hepatitis B incidence in recent decades, with a significantly higher incidence rate than acute hepatitis B. The proportion of unclassified hepatitis B decreased year by year, as shown in **Figure 1**.



**Figure 1.** Hepatitis B incidence rate in Harbin from 2010 to 2023

### 3.2. Temporal distribution

Hepatitis B cases occur every month, with a slightly higher incidence in March each year, accounting for 10.27%, and a slightly lower incidence in October, accounting for 7.24%. The proportion of cases in other months ranges from 7.24% to 10.27%. The average monthly incidence from 2010 to 2023 was slightly lower than that in 2023, but significantly higher than the average monthly incidence from 2020 to 2022.

### 3.3. Regional distribution

From 2010 to 2023, the districts/counties with the highest annual average incidence rates in Harbin were Wuchang City, Mulan County, and Yanshou County, while the lowest rates were found in Nangang District, Shuangcheng City, and Xiangfang District. Six districts/counties exceeded the city's annual average incidence level, accounting for 33.33%. Most districts/counties have decreased to lower incidence levels in the past four years, but there were a few districts/counties where the incidence significantly increased in 2023, with Bayan County reaching a peak level of 187.74/100,000 and Mulan County reaching a high level of 166.48/100,000, as illustrated in **Table 1**.

**Table 1.** Number of hepatitis B cases and incidence rates (1/100,000) in various districts/counties of Harbin from 2010 to 2023

Region	2010	2011	2012	2013	2014	2015	2016	2017
Harbin City	3000 (29.98)	3281 (30.85)	3110 (29.9)	2477 (23.35)	2604 (24.54)	2694 (25.41)	2616 (24.87)	3090 (28.87)
Daoli District	126 (15.92)	97 (10.5)	113 (12.58)	142 (15.41)	140 (15.19)	106 (11.51)	117 (12.75)	136 (14.56)
Nangang District	123 (12.17)	127 (9.45)	116 (8.94)	122 (9.1)	105 (7.83)	90 (6.72)	82 (6.17)	111 (8.21)
Daowai District	136 (19.28)	125 (13.79)	153 (17.33)	121 (13.38)	114 (12.61)	96 (10.62)	125 (13.95)	145 (15.91)
Pingfang District	20 (10.85)	22 (11.56)	24 (12.97)	25 (13.18)	35 (18.44)	47 (24.78)	31 (16.49)	39 (20.38)
Songbei District	34 (16.87)	34 (14.36)	54 (22.8)	32 (13.55)	36 (15.24)	35 (14.82)	35 (14.95)	44 (18.47)
Xiangfang District	115 (14.31)	97 (10.58)	106 (11.96)	137 (14.99)	141 (15.42)	118 (12.92)	97 (10.71)	117 (12.69)
Hulan District	106 (17)	119 (15.57)	85 (11.12)	89 (11.67)	126 (16.52)	78 (10.23)	85 (11.25)	127 (16.52)

**Table 1 (Continued)**

Region	2010	2011	2012	2013	2014	2015	2016	2017
Acheng District	146 (21.29)	168 (28.15)	215 (36.79)	193 (32.42)	206 (34.6)	227 (38.15)	197 (33.4)	185 (30.82)
Shuangcheng City	117 (14.44)	121 (14.66)	126 (15.58)	122 (14.82)	103 (12.51)	117 (14.21)	88 (10.78)	69 (8.31)
Yilan County	170 (43.02)	178 (45.84)	140 (36.75)	137 (35.37)	82 (21.17)	89 (22.99)	58 (15.11)	72 (18.44)
Fangzheng County	70 (29.61)	123 (60.34)	122 (61.28)	92 (45.25)	73 (35.9)	126 (62)	56 (27.8)	57 (27.8)
Bin County	155 (26.64)	210 (38.09)	223 (41.20)	110 (20.01)	120 (21.82)	94 (17.1)	86 (15.78)	94 (16.95)
Bin County	703 (106.17)	868 (146.98)	511 (88.01)	248 (42.11)	149 (25.29)	141 (23.95)	119 (20.39)	207 (34.85)
Mulan County	167 (59.3)	196 (70.58)	165 (60.35)	160 (57.77)	206 (74.37)	191 (68.99)	178 (64.86)	261 (93.45)
Tonghe County	32 (15.16)	28 (13.29)	30 (14.62)	24 (11.42)	25 (11.9)	28 (13.33)	28 (13.45)	58 (27.38)
Yanshou County	330 (142.4)	300 (123.73)	266 (111.63)	239 (98.84)	158 (65.33)	117 (48.40)	93 (38.81)	128 (52.49)
Shangzhi City	127 (20.24)	166 (28.36)	159 (27.77)	112 (19.18)	86 (14.73)	111 (19.02)	116 (20.05)	153 (25.99)
Wuchang City	303 (31.47)	297 (33.7)	485 (56.09)	372 (42.33)	699 (79.52)	883 (100.51)	1025 (117.69)	1087 (122.65)
Region	2018	2019	2020	2021	2022	2023	Annual average	
Harbin City	3338 (30.54)	3258 (30.01)	1918 (17.77)	2067 (20.65)	1846 (18.73)	3305 (33.64)	38604 (26.38)	
Daoli District	138 (14.47)	172 (19.01)	89 (10.29)	110 (10.02)	91 (8.39)	128 (11.8)	1705 (12.9)	
Nangang District	141 (10.22)	148 (10.66)	104 (7.57)	116 (8.34)	117 (8.5)	136 (9.86)	1638 (8.79)	
Daowai District	115 (12.35)	114 (13.7)	70 (7.56)	95 (11.71)	83 (10.36)	113 (14.11)	1605 (13.25)	
Pingfang District	27 (13.82)	29 (14.31)	33 (16.97)	36 (15.07)	53 (22.42)	43 (18.17)	464 (16.5)	
Songbei District	60 (16.16)	101 (27.18)	99 (26.75)	70 (8.9)	103 (25.13)	131 (16.85)	868 (17.56)	
Xiangfang District	139 (14.77)	174 (18.27)	99 (10.57)	81 (7.23)	88 (7.94)	132 (11.89)	1641 (12.3)	
Hulan District	133 (20.24)	165 (25.07)	152 (23.26)	127 (31.97)	148 (19.42)	146 (36.76)	1686 (17.77)	
Acheng District	183 (29.85)	152 (24.64)	91 (14.92)	71 (14.19)	76 (15.38)	82 (16.59)	2192 (26.83)	
Shuangcheng City	126 (14.86)	96 (11.24)	60 (7.11)	47 (7.41)	52 (8.31)	104 (16.63)	1348 (12.26)	
Yilan County	69 (17.3)	62 (15.32)	36 (9.07)	77 (29.8)	63 (25.04)	71 (28.63)	1304 (25.78)	
Fangzheng County	38 (18.15)	28 (13.18)	28 (13.44)	25 (13.6)	23 (12.85)	38 (21.52)	899 (31.82)	
Bin County	92 (16.25)	100 (17.54)	53 (9.4)	81 (18.23)	83 (19.17)	274 (64.17)	1775 (23.9)	
Bin County	154 (25.39)	187 (30.64)	145 (24.02)	165 (39.25)	267 (65.16)	759 (187.74)	4623 (59.02)	
Mulan County	305 (106.94)	274 (94.93)	140 (49.32)	136 (77.16)	111 (64.64)	282 (166.48)	2772 (77.16)	
Tonghe County	58 (26.81)	53 (23.91)	55 (25.54)	100 (55.61)	57 (32.54)	108 (62.52)	684 (23.93)	
Yanshou County	81 (32.53)	72 (28.64)	50 (20.17)	34 (18.61)	23 (12.92)	46 (26.21)	1937 (60.42)	
Shangzhi City	114 (18.96)	136 (22.4)	73 (12.2)	59 (12.73)	64 (14.17)	224 (50.24)	1700 (21.6)	
Wuchang City	1365 (150.82)	1195 (131.13)	541 (60.05)	637 (87.9)	344 (48.66)	488 (69.89)	9721 (81.35)	

Note: 42 cases with unknown addresses were not included in the statistics.

### 3.4. Population distribution

#### 3.4.1. Age distribution

From 2010 to 2023, the average incidence of hepatitis B in our city showed a trend of first increasing and then

decreasing with age. The lowest incidence was 1.72/100,000 in the < 10-year-old group, and the highest was 34.71/100,000 in the 40-year-old group. The highest incidence occurred in the 30–69 age group, accounting for 75.35% of cases, as shown in **Table 2**.

**Table 2.** Hepatitis B incidence in Harbin from 2010 to 2023

Survey content		Total cases	Average incidence rate (per 100,000)	Proportion (%)
Age	0-	193	1.70	0.48
	10-	648	5.50	1.62
	20-	6487	27.70	16.19
	30-	7960	32.49	19.87
	40-	8797	33.66	21.96
	50-	7696	31.43	19.21
	60-	4634	31.72	11.57
	70-	1713	22.91	4.28
	80-	476	18.69	1.19
	Male	22258	28.74	55.56
Gender	Female	16346	21.26	40.80
Occupation	Students and preschoolers	333	-	0.86
	Medical personnel	59	-	0.15
	Workers	1323	-	3.43
	Farmers	22125	-	57.31
	Retirees	1810	-	4.69
	Homemakers and unemployed	8936	-	23.15
	Others	4018	-	10.41

### 3.4.2. Gender distribution

From 2010 to 2023, the annual average incidence of hepatitis B in the city was 28.74/100,000 for males and 21.26/100,000 for females, with a gender ratio of 1.35:1. This indicates a significant association between age group and gender ( $\chi^2=71.73$ ,  $P < 0.05$ ), meaning there are significant differences in gender composition among different age groups. The proportion of males was higher in the < 20-year-old group compared to the  $\geq 30$ -year-old group, while the proportion of females was lower in the < 20-year-old group compared to the  $\geq 30$ -year-old group, as shown in **Table 3**.

**Table 3.** Comparison of gender differences in hepatitis B incidence among age groups < 20 and  $\geq 30$  in Harbin

Age group	Male case count	Male proportion (%)	Female case count	Female proportion (%)	P-value
< 20 years	410	48.75	319	51.25	$\chi^2 = 71.73$ , $p < 0.05$
$\geq 30$ years	19083	61.01	12193	38.99	

### 3.4.3. Occupational distribution

Based on **Table 2**, from 2010 to 2023, hepatitis B cases in our city were mainly among farmers, with 22,125 cases accounting for 57.31%, followed by homemakers and unemployed individuals, with 8,936 cases accounting for 23.15%

## 4. Discussion

Eliminating viral hepatitis is a global goal <sup>[2]</sup>. Since the implementation of the hepatitis B network direct reporting system in China in 1990, the number of cases has remained high. In 2002, China implemented an expanded national immunization program strategy. Harbin started vaccinating against hepatitis B in 1985 and officially included the hepatitis B vaccine in the national immunization program in 2003, providing free vaccination. This study analyzed hepatitis B incidence data from nine districts and nine counties/cities in Harbin from 2010 to 2023, describing the epidemiological distribution and trends of hepatitis B. This provides a scientific basis for targeted hepatitis B prevention and control efforts in Harbin.

From 2010 to 2023, the average incidence of hepatitis B in Harbin was 26.38 per 100,000, lower than the national average from 2011 to 2021 but higher than the average incidence in Shijingshan District of Beijing during the same period <sup>[5, 6]</sup>. Except for the years 2020–2022 affected by the epidemic, the overall incidence of hepatitis B showed a trend of decreasing first and then increasing. The incidence of hepatitis B showed a downward trend from 2010 to 2014, a slight increase from 2015 to 2019, but still lower than the average level in Henan Province from 2013 to 2019 <sup>[7]</sup>. From 2020 to 2022, it dropped to a lower level of 17.77 per 100,000, and the monthly average incidence from 2010 to 2023 was significantly higher than that from 2020 to 2022. The analysis suggests that during the COVID-19 pandemic, due to a significant reduction in personnel mobility, the rate of hospital visits and reporting also decreased <sup>[8]</sup>. The average mortality rate from 2010 to 2023 was 0.06 per 100,000, slightly higher than that of Qingzhou City <sup>[9]</sup>. Chronic hepatitis B is the main type in our city, with a significantly higher incidence than acute hepatitis B. Acute hepatitis B shows a decreasing trend year by year, and the proportion of unclassified hepatitis B is decreasing year by year. This is consistent with other domestic research results <sup>[10]</sup>. The decreasing proportion of unclassified hepatitis B reflects the increasing emphasis on hepatitis B in Harbin and the increased investment in medical resources, leading to more refined diagnosis.

In terms of temporal distribution, hepatitis B shows fluctuations across different years, with no obvious seasonal distribution. However, the incidence is slightly higher in March and lower in October every year. This may be related to factors such as reduced hospital visits during the Spring Festival, increased visits after the holiday, fewer visits during the busy autumn farming season and work, as well as climatic factors, which deserve further exploration.

In terms of regional distribution, there are significant differences in hepatitis B incidence across different regions. High-incidence areas are mainly concentrated in certain remote and specific regions, such as Wuchang City, Mulan County, Yanshou County, and Bayan County. The incidence is much higher than that in the main urban areas (Daoli District, Nangang District, Xiangfang District, Daowai District, Pingfang District, Songbei District). In some years, the incidence of hepatitis B in some districts and counties is significantly higher than the annual average incidence, such as Bayan County and Mulan County in 2023. The uneven regional distribution may be affected by local economic conditions, vaccination, timely diagnosis and treatment, and medical level. It may also be related to geographical environment, environmental hygiene, and other factors. This suggests that

these areas should be the key target areas for hepatitis B prevention and control.

In terms of population distribution, there are significant differences in hepatitis B incidence among different age groups. The lowest incidence is 1.7 per 100,000 in the < 10-year-old age group. Cases are mainly concentrated in the 30–69 age group, which is consistent with reports from Wuhan City, Hubei Province <sup>[11]</sup>. This suggests that immunization in the younger age group has achieved significant results. The incidence of hepatitis B is higher in males than in females, consistent with reports in our province <sup>[12]</sup>. The incidence of hepatitis B is higher in males than in females among children under 10 and adults aged 20 and over ( $P < 0.05$ ), which may be related to males' living habits, occupational exposure, and immune status. Additionally, there are differences in hepatitis B incidence among different occupations, with farmers accounting for more than half. This may be due to remote locations, economic conditions, inadequate medical conditions, low educational level, limited disease awareness, and lack of timely access to formal treatment <sup>[13]</sup>. It may also be related to insufficient awareness of hepatitis B vaccines <sup>[14]</sup>. Secondly, homework and unemployed people are analyzed. As China is a large agricultural country, it is speculated that most of the homework and unemployed people are farmers. This suggests that this population is a key target group for hepatitis B prevention and control strategies, and different strategies should be developed for different populations.

## 5. Conclusion

In summary, except for a significant decrease from 2020 to 2022, the overall incidence of hepatitis B in our city showed a trend of decreasing first and then increasing from 2010 to 2023. The prevention and control measures for the 0-19 age group have achieved significant results. It is necessary to strengthen hepatitis B prevention and control efforts for adults over 20 years old, especially to develop differentiated hepatitis B prevention and control strategies for key areas and high-risk populations. Firstly, on the basis of continuing to do a good job in hepatitis B vaccine immunization for newborns, efforts should be made to strengthen the promotion and vaccination of hepatitis B vaccines for adults, especially for high-risk populations. By increasing vaccination coverage, the incidence of hepatitis B can be effectively reduced. Secondly, screening and diagnosis of hepatitis B should be carried out for adults, especially in key areas and populations <sup>[15]</sup>. For people suspected of having hepatitis B infection, serological testing and viral load measurement should be performed in a timely manner to facilitate early detection and treatment. In addition, for patients already diagnosed with hepatitis B, standardized antiviral treatment and follow-up management should be carried out to reduce the harm and disease burden of hepatitis B. Finally, health education should be further promoted to raise awareness and prevention awareness of hepatitis B among the masses. This will enable the masses to understand relevant prevention and treatment knowledge about hepatitis B, enhance self-protection awareness, reduce the risk of hepatitis B transmission, and actively seek treatment.

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## Disclosure statement

The authors declare no conflict of interest.

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