

# **Seroprevalence of hepatitis B and hepatitis C virus infections in Diyala province during 2003-2008**

**Azher S. Al-Jebori, Abdul-Razak SH. Hasan, Abbas A. Al-Duliami**

## Abstract

**Background:** The seroprevalence of hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are largely depend on the rate of chronic carrier in the community and the predominant route of infection.

**Objectives:** to investigate the seroprevalence of hepatitis B and hepatitis C virus infection in Diyala province during the period from 2003 to 2008.

**Materials and methods:** This study was conducted for the period from 1/February/2003 to 30/April/2008. Data were extracted from records of the virology unit in the Public Health Laboratory in Baquba. Data were translated to computerized data base and statistically analyzed.

**Results:** The highest annual prevalence rate of HBV infection was found in 2004 (5.5/1000 tested samples) and highest annual prevalence rate of HCV infection was found in 2004 (2.5/1000 tested samples). The HBV and HCV positive cases were peaked in April months. The HBV positive cases were significantly higher among the age group (20-29) years ( $p < 0.001$ ). The HCV positive cases were significantly higher among the age group (30-39) years ( $p < 0.001$ ). There is no association between HBV and HCV positivity rates and the district of residence. The HBV and HCV positivity rates were significantly higher ( $p = 0.009$ ) in males compared to females.

**Conclusion:** Although the annual seroprevalence of HBV is slightly decline, the annual seroprevalence of HCV is increased. Strengthening of surveillance system is recommended.

**Key words:** HBV, HCV, seroprevalence

## Introduction:

The estimated global prevalence of viral hepatitis is around 3%-5%, which means that approximately 400 million people are infected with HBV and around 170 million with HCV [1]. HBV and HCV infections are of major public health concern; infected individuals carry a substantial risk for chronic liver disease, 5%-10% for HBV and more than 50% for HCV[2,3]. Furthermore, Several studies have been linked the chronic hepatitis C infection with extrahepatic manifestations [4,5]. HBV and HCV share the common feature is that all practices, involves blood-to-blood exposure and other body fluids can potentially be a sources of infection [6,7] . Moreover, individuals infected with HBV and to a lesser degree HCV, may transmit the virus to their sexual partners, and in case of mothers to their babies [8,9].

The prevalence of HBV and HCV infections have a wide geographical variation depending on the rate of chronic carrier and the predominant route of transmission [10,11]. In Iraq, the intrafamilial childhood horizontal transmission is an important means by which HBV endemicity rate is maintained [12]. In a previous study conducted from 1989 to 2002, the prevalence of HBV among volunteers blood donors was 1.6%, and higher prevalence was recorded among risky population [13,14]. However, the prevalence of HCV infection was much lower than HBV infection, being 0.15% among blood donors and highest in multiple blood recipients [15,16]. The present retrospective study was conducted to determined the annual prevalence of HBV and HCV infections for the period from 2003 to 2008 and to explore whether a change in the prevalence of these viral infections.

Materials and methods:

This study was conducted for the period from 1/February/2003 to 30/April/2008. Data were extracted from records of the virology unit in the Public Health Laboratory in Baquba. Detection of HBsAg was carried out by enzyme-linked immunosorbant assay (ELISA) and confirmed by HBsAg confirmatory test. The anti-HCV antibody was detected by ELISA and confirmed by immunoblot assay. Demographic informations of HBV and HCV positive patients including age, sex, and residence were also collected. Data were translated to computerized data base and statistically analyzed.

Results:

Results presented in table (1) revealed the annual seroprevalence rate (per 1000 tested samples) of HBV infection throughout the study period. The highest seroprevalence rate was found in 2004 (5.5/1000 tested samples) with a 95% confidence interval range (4.7-6.3).

**Table (1) Annual prevalence of HBV infection during study period.**

Year	No. tested	No. positive	Annual prevalence (per 1000)	95% CI for prevalence (per 1000)
2003	22324	97	4.3	(3.5-5.2)
2004	32685	181	5.5	(4.7-6.3)
2005	12727	27	2.1	(1.3-2.9)
2006	25544	98	3.8	(3.1-4.6)
2007	10075	26	2.6	(1.6-3.6)
2008	17105	46	2.7	(1.9-3.5)
Total	120460	475	3.9	(3.6-4.3)

Results presented in table (2) revealed the annual seroprevalence rate (per 1000 tested samples) of HCV infection throughout the study period. The highest seroprevalence rate was found in 2004 (2.5/1000 tested samples) with a 95% confidence interval range (2-3.1).

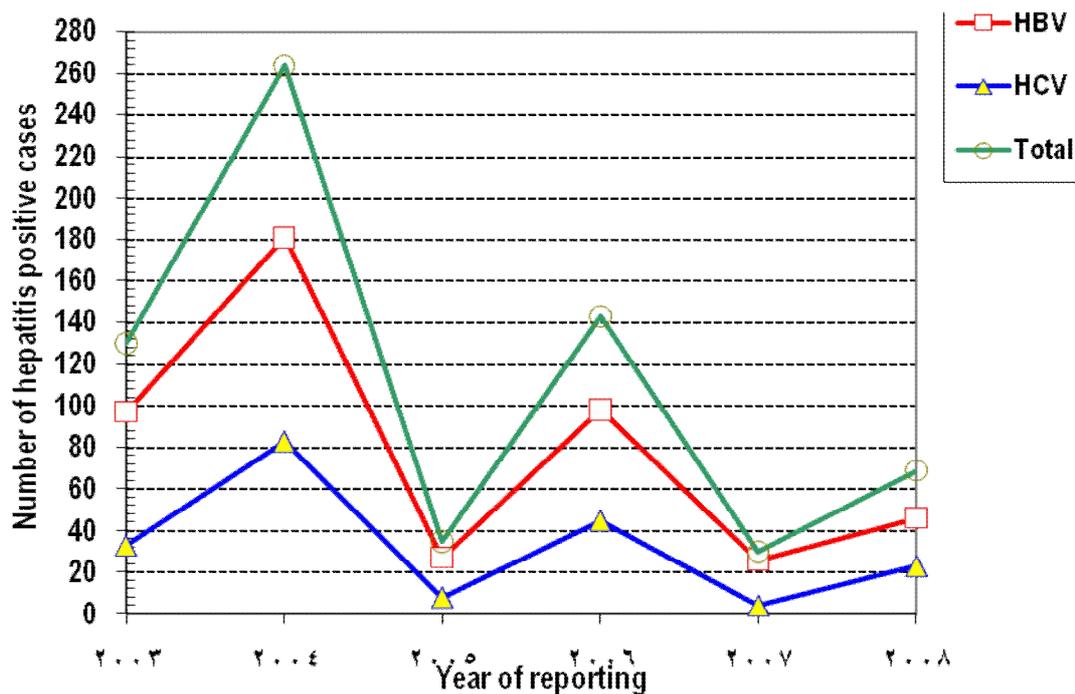
**Table (2): Annual prevalence of HCV infection during study period.**

Year	No. tested	No. positive	Annual prevalence (per 1000)	95% CI for prevalence (per 1000)
2003	22324	33	1.5	(1-2)
2004	32685	83	2.5	(2-3.1)
2005	12727	8	0.6	(0.2-1.1)
2006	25544	45	1.8	(1.2-2.3)
2007	10075	4	0.4	(0-0.8)
2008	17105	23	1.3	(0.8-1.9)
Total	120460	196	1.6	(1.4-1.9)

The distribution of HBV and HCV positive cases by year throughout the study period was shown in table (3) and figure (1).

**Table (3): HBV and HCV positive cases by year.**

Type of infection	Year						
	2003	2004	2005	2006	2007	2008	median
HBV	97	181	27	98	26	46	46
HCV	33	83	8	45	4	23	23
Total	130	264	35	143	30	69	69

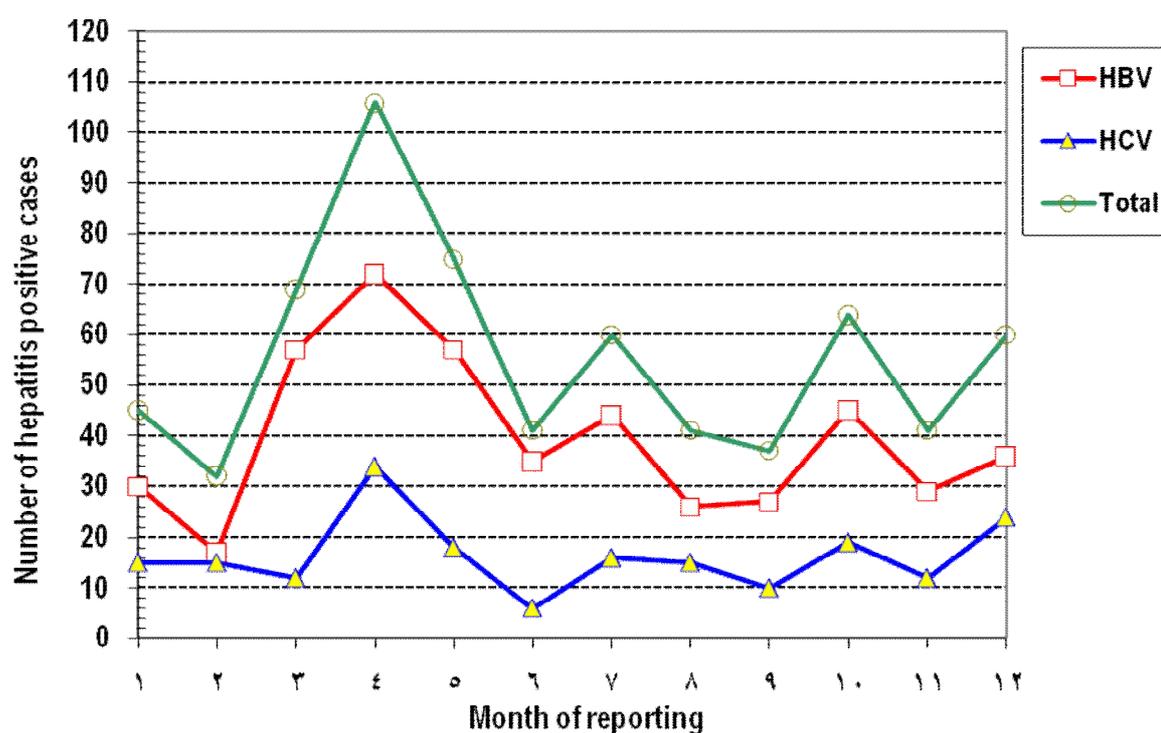


**Figure (1): Yearly reporting cases during the study period.**

Table (4) and figure (2) represent the monthly distribution of HBV and HCV positive cases throughout the study period (6 years). It was found that both HBV and HCV positive cases were peaked during April month.

**Table (4): HBV and HCV positive cases by month.**

Type of infection	Months												Median
	1	2	3	4	5	6	7	8	9	10	11	12	
HBV	30	17	57	72	57	35	44	26	27	45	29	36	35
HCV	15	15	12	34	18	6	16	15	10	19	12	24	15
Total	45	32	69	106	75	41	60	41	37	64	41	60	52



**Figure (2): Monthly reporting cases during the study period**

The distribution of HBV and HCV positive cases according to the age was presented in table (5). The HBV positive cases were significantly higher among the age group (20-29) years (p Chi-square <0.001). Whereas the HCV positive cases were significantly higher among the age group (30-39) years (p Chi-square < 0.001).

**Table (5): distribution of HBV and HCV positive cases by age**

Age groups (Ys)	Type of viral hepatitis	
	HBV (No.%)	HCV (No. %)
< 10	12(2.5)	11(5.6)
10-19	70(14.7)	52(26.5)
20-29	150(31.6)	54(27.6)
30-39	139(29.3)	55(28.1)
40-49	54(11.4)	16(8.2)
50 +	50(10.5)	8(4.1)
Total	475 (100)	196 (100)

The residences of patients were distributed over the five districts in Diyala province. Although, nearly a half (48%) of HBV positive and (40.8%) of HCV positive patients were from Baquba district. However, statistical analysis showed that there is no association between HBV and HCV seropositivity rates and the district of residence, table (6).

**Table (6): distribution of HBV and HCV positive cases by residence**

District of residence	Type of viral hepatitis	
	HBV (No.%)	HCV (No.%)
Baquba	228(48)	80(40.8)
Khalis	88(18.5)	41(20.9)
Baladruz	65(13.7)	31(15.8)
Muqdadia	77(16.2)	35(17.9)
Jalawla	17(3.6)	9(4.6)
Total	475 (100)	196 (100)

Regarding the gender, the results showed that the HBV seropositivity rate was significantly higher ( $p= 0.009$ ) in males compared to females (66.7% vs 33.3%). Likewise, the HCV seropositivity rate was significantly higher in males compared to females (56.1% vs 43.9%), table (7).

**Table (7): distribution of HBV and HCV positive cases by gender**

District of residence	Type of viral hepatitis	
	HBV (No.%)	HCV (No.%)
Female	158 (33.3)	86(43.9)
Male	317(66.7)	110(56.1)
Total	475 (100)	196 (100)

### Discussion:

Hepatitis B and hepatitis C virus infections are of major public health concern due to their serious complications on one hand, and their transmission by routes that permits intrafamilial spread on the other hand [2,4,9,11,12]. Comparing with our previous studies on the seroprevalence of HBV and HCV in Diyala province before year 2003 [13,15], the present study found that the seroprevalence of HBV infection is dropped down (1.6% and 0.55%) respectively. These encouraging results may be due to the implementation of HB vaccine in the national program of immunization for newborns and risky groups since 1989. Although there is no national evaluation of vaccines; nevertheless, the vaccine was proved its high immunogenicity and efficacious elsewhere [17-19]. Another explanation for the decline in the seroprevalence of HBV infection is the cumulative health knowledge of the general population as a result of intensive education programs carried out during the 1990s. On the other hand, the tragic deterioration of security situation during 2003 and upward intermittently retarded the infectious disease control programs. Hepatitis B surveillance and counseling system and even vaccination are of these affected programs that undoubtedly resulting in under recoding of HBV positive cases [20].

Unlike HBV infection, HCV infection characterized by low plasma viral load, long incubation period that may extend to 3 months, the majority of infections are asymptomatic, and the high chronicity rate [21,22]. These factors delay the seroconversion and consequently the serological diagnosis of HCV infection and perpetuate the infectiousness of patients for longer period [23,24]. Together these facts may explain the increased prevalence of HCV infection in the present study compared to previous one [15]. Therefore, to minimize the risk of transmission of HCV infection through blood transfusion, several countries have introduced the nucleic acid technique (NAT) as a routine screening of blood donors [25]. The high

sensitivity and specificity of NAT has minimized the risk of infection per blood unit to 1:1600000, and reduced the window period of HCV which was approximately 70 days by ELISA to 8-10 days [26].

The present results found that HBV and HCV infection were significantly higher among the age groups (20-29) and (30-39) respectively. These results were consistent with our studies conducted before 2003 [13,15], and with those conducted elsewhere, probably because these age groups have higher chance for exposure to HBV and HCV infections[27,28]. On the other hand, the significantly higher HBV and HCV positivity rates among males compared to females was concordant in present study and previous ones and with the results of other workers [13,15,29,30]. Of note, the bulk of individuals included in the present study are blood donors, and as traditions in our community, most of the blood donors attending the blood banks are males [31, 32].

The present study found that the HBV and HCV positivity rates were peaked during April month. This result is inconsistent with the most previous reports affirming no seasonality in the transmission of these viruses [7, 20]. However, further studies to clarify this puzzling result are recommended.

Regarding the distribution of HBV and HCV positive cases according to the residence, although there was insignificant difference in the present study, Baquba district was found to harbor the highest number of cases, and this is inconsistent with our previous studies, in which Al-Mukdadia district has the highest number [13,15]. The reasonable explanation is that Al-Mukdadia and other districts are at least 30 kilometers away from the center of the Diyala province, so the patients meet difficulties to reach the center of the province under bad security situations which was prevalent particularly during 2005 to 2007.

## References:

1. Degertekin, B. and Lok, A.S. Update on viral hepatitis. *Curr. Opin. Gastroenterol.* 2009; 25(3): 180-5.
2. Taylor, B.C.; Yuan, J.M.; Shamliyan, k T.A.; Shaukat, A.; Kane, R.L. and Wilt, T.J. Clinical outcomes in adults with chronic hepatitis B in association with patients and viral characteristics: A systemic review of evidence. *Hepatology*, 2009; 49(Suppl.5): s85-95.
3. Alter, H. and Seeff, L. Recovery, persistence and sequelae in hepatitis C virus infection. A prospective on long-term outcome. *Semin. Liver Dis.* 2000; 20: 17-35.
4. Nocente, R.; Ceccanti, M.; Bertazzoni, G.; Cammarota, G.; Silveri, N. and Gasbarrini, G. HCV infection and extrahepatic manifestations. *Hepatogastroenterology*, 2003; 50(52): 1149-54.
5. Manns, M.P. and Rambusch, E.G. Autoimmunity and extrahepatic manifestations in hepatitis C virus infection. *J. Hepatol.* 1999; 31(Suppl.1): 39-42.
6. Dement, J.M.; Epling, C.; Ostbye, T.; Pompeii, L.A.; Hunt, D.L.; *et al.* Blood and body fluid exposure risks among health care workers. *Am. J. Ind. Med.* 2004; 46(6): 637-48.
7. Dienstag, J.L. Hepatitis B virus infection. *N. Engl. J. Med.* 2008; 359(14): 1486-1500.
8. Magder, L.S.; Fix, A.D.; Mikhail, N.N.; Mohamed, M.K.; Abdel-Hamid, M.; *et al.* Estimation of the risk of transmission of hepatitis C between spouses in Egypt based on seroprevalence data. *Int. J. Epidemiol.* 2005; 34(1): 160-5.
9. Alizadeh, A.H.; Ranjbar, M. and Yadollahzadeh, M. Patients concerns regarding chronic hepatitis B and C infection. *East Medit. Health J.* 2008; 14(5): 1142-7.
10. Toukan, A.U.; Sharaiha, Z.K.; Abu-El-Rub, O.A. The epidemiology of hepatitis B virus among family members in the Middle East. *Am. J. Epidemiol.* 1990; 132: 220-32.
11. Mastromatteo, A.M.; Rapaccini, G.L.; Pompili, M.; Ursino, S. Romano, V.; *et al.* Hepatitis C virus infection: other biological fluids than blood may be responsible for intrafamilial spread. *Hepatogastroenterology*, 2001; 48(37): 193-6.

12. Hasan, A. SH. Intrafamilial clustering of hepatitis B infection. *Iraqi J. Commun. Med.* 2005; 18(2): 134-9.
13. Hasan, A. SH.; Omer, A.R. and Jalil, I. Seroepidemiological study of hepatitis B virus infection among blood donors and risky groups in Diyala. *Iraqi J. Commun. Med.* 2006; 19(1): 14-9.
14. Hasan, A.SH. Prevalence of hepatitis B and hepatitis C virus infections among health care workers. *Diyala J.* 2003; 15: 154-60.
15. Hasan, A.SH. Prevalence of anti-hepatitis C virus antibodies among blood donors and risky groups in Diyala. *J. Fac. Med.(Baghdad)*, 2008; 50(4): 467-70.
16. Hasan, A.SH.; Al-Duliami, B.N.; Al-Duliami, A.A. and Jabbar, F.A. The prevalence of certain blood transmitted virus infections among hemophilia and thalassemia patients in Diyala. *Diyala J.* 2004; 18: 157-65.
17. Keating, G. and Noble, S. Recombinant hepatitis B vaccine (EngerixB) a review of its immunogenicity and protective efficacy against hepatitis B. *Drugs*, 2003;63: 1021-51.
18. Reda, A.A.; Arafa, M.A. ; Youssry, A.A. ; Wandan, E.H.; Abde Ati, M. and Daebees, H. Epidemiologic evaluation of the immunity against hepatitis B in Alexandria, Egypt. *Eur. J. Epidemiol.* 2003; 18:1007-11.
19. Sallam, T.A.; Alghsham, H.M.; Ablohom, A.A.; Alarosi, M.S.; Almotawakel, R.E.; *et al.* Immune response to hepatitis B vaccine among children in Yemen. *Saudi Med. J.* 2005; 26(2): 281-4.
20. Ali, H.Y.M. Hepatitis B infection among Iraqi children:the impact of sanction. *East Mediter. Health J.* 2004; 10(1-2): 6-11.
21. Thomas, B.J. and Finch R.G. Hepatitis C virus infection. *Clin. Microbiol. Infect.* 2005; 11(2):86-94.
22. Cox, A.L.; Netski, D.M. and Mosbrugger, T. Prospective evaluation of community-acquired acute phase hepatitis C virus infection. *Clin. Infect. Dis.* 2005; 40(7): 951-8.
23. Rerksupphol, S.; Hardikar, W. and Dore, G. Long-term outcome of vertically acquired and post-transfusion hepatitis C infection in children. *J. Gastroenterol. Hepatol.* 2004; 19(12): 1357-62.
24. Gretch, D.R. Use and interpretation of HCV diagnostic tests in the clinical setting. *Clin. Liver Dis.* 1997; 1(3): 543-57.

25. Allain, J.P. Transfusion risks of yesterday and of today. *Transfus. Clin. Biol.* 2003; 10(1): 1-5.
26. Busch, M.; Kleinman, S. and Nemo, G. Current and emerging infectious risks of blood transfusion. *JAMA* 2003; 289 (8): 959-62.
27. Yildirim, B.; Barut, S.; Bulut, Y.; Yenisehiril, G. Ozdemir, M.; Cetin, I.; *et al.* Seroprevalence of hepatitis B and C viruses in the province of Tokat in the Black Sea region of Turkey: A population-based study. *Turk. J. Gastroenterol.* 2009; 20(1): 27-30.
28. El-Hazmi, M.M. Prevalence of HBV, HCV, HIV-1,2 and HTLV-I/II infections among blood donors in a teaching hospital in the central region of Saudi Arabia. *Saudi Med. J.* 2004; 25(1): 26-33.
29. Nafeh, M.; Medhat, A.; Shehata, M.; Mikhail, N.; Swifee, Y.; *et al.* Hepatitis C in a community in upper Egypt: Cross-sectional survey. *Am. J. Trop. Med. Hyg.* 2000; 63(5-6): 236-41.
30. Alter, M.J. Epidemiology and prevention of hepatitis B. *Semin. Liver Dis.* 2003; 23(1): 39-46.
31. Kader, M.; Ismail, A. and Tahir, S. Seropositivity of hepatitis B and C among different groups of population in Al-Tameem province. *Iraqi J. Commun. Med.* 2001; 14: 21- 4.
32. Mahmood, A.; Addose, S.; Salih, A. and Khadi, A. Seroprevalence of HBsAg and Anti-HCV positive blood donors in Najaf governorate. *Iraqi J. commun. Med.* 2001; 14: 29-33.