

Prevalence of Viral Hepatitis B, C, and Human Immunodeficiency Virus among End Stage Renal Disease Patients on Hemodialysis

Nadia Aziz Nasir*, Marwa Anees Abdilazeem**

ABSTRACT:

BACKGROUND:

Viral hepatitis infections are an important cause of morbidity and mortality in patients with end-stage renal disease (ESRD) on hemodialysis (HD), and its prevalence varies considerably among different areas of the world.

OBJECTIVE:

The aim was to investigate the prevalence of the HBV, HCV, and HIV among patients with ESRD on HD in a Hemodialysis Center in Baghdad, and to identify the factors associated with their transmission.

PATIENTS AND METHODS:

A cross-sectional study was carried out in the HD Center in Al-Kindy Teaching Hospital in Baghdad, Iraq. A total of 302 patients with ESRD on HD were enrolled in the period from February to May 2017. They were tested for the presence of hepatitis B surface antigen (HBs Ag), antibodies for hepatitis C virus (anti-HCV), and antibodies for human immunodeficiency virus (Anti-HIV).

RESULTS:

From the 302 patients; the mean age patients was 51.06 ± 15.15 SD years, 176 (58.27%) were males, and 126 (41.72%) females. Four (1.3%) patients had positive HBs Ag. One (0.3%) male had anti-HIV Ab, and 140 (46.36%) had anti-HCV-Antibodies positive. Male gender, age between 41-60 years, been married, and unemployed patients scored a higher prevalence of anti-HCV positivity. The causes of renal failure in HCV patients were; hypertension in 44 (31.4%), diabetes mellitus in 34 (24.3%), renal diseases (like UTI, AGN, Renal stones) in 21 (15%), congenital renal diseases in 15 (10.7%), and unknown cause in 26 (18.6%). There were highly significant differences in the mean number of blood transfusions and the mean HD duration between HCV and non-HCV groups. There was a significant association between HCV infection and renal failure duration, and a history of surgery. Significant differences were also reported in the mean serum creatinine and hemoglobin levels between HCV and non-HCV groups.

CONCLUSION AND RECOMMENDATIONS:

The prevalence of HBV and HIV infections were low and the prevalence of HCV was high. HCV infection was related to the higher number of blood transfusions, longer duration of renal failure, longer duration of HD, a history of surgery, creatinine and Hemoglobin levels. The study recommends local guidelines emphasizing on blood safety strategies, implementation of infection control practices with regular monitoring.

KEYWORDS: Hepatitis B, C, HIV, ESRD, HD, Baghdad.

INTRODUCTION:

Hemodialysis (HD) is the most frequent mode of renal replacement therapy in end-stage renal disease (ESRD).⁽¹⁾ Patients undergoing HD potentially have an increased risk of exposure to infections especially blood-borne viruses (BBV) infections. Viral hepatitis such as hepatitis

B virus (HBV), hepatitis C virus (HCV), and human immunodeficiency virus (HIV) is the most frequent disease resulting as a complication of HD treatment⁽²⁾. Infections with HBV and HCV are well-known and important causes of liver disease in ESRD patients on HD.^(3,4)

* Community Medicine Department, College of Medicine, University of Baghdad

** Al-Shaab Health Center

HD patients are at high risk for viral hepatitis and HIV infections due to a history of blood transfusion, the high number of blood transfusion sessions, organ transplantation, chronic hemodialysis, drug injection, occupational exposure among healthcare workers, unprotected sex, vertical transmission, the potential for exposure to infected patients and contaminated equipment. The duration of HD therapy is also considered as a risk factor for viral hepatitis and HIV infections transmission.^(5,6)

HBV, HCV and HIV infections are important causes of morbidity and mortality among HD patients and pose problems in the management of patients in the renal dialysis units.⁽⁷⁾ The prevalence of viral hepatitis and HIV infections in patients on HD is far higher than the prevalence of these diseases in the general population.⁽²⁾ HBV infection is less prevalent than HCV in HD units⁽⁸⁾. The prevalence of HBV infection within HD units in developing countries range from 2% to 20%⁽⁹⁾, and HCV prevalence among HD patients varies from 4% to 70% in different countries⁽¹⁰⁾.

Hepatitis C virus (HCV) is a major public health problem, with an estimated global prevalence of 3% occurring in about 170 million persons worldwide.

Hepatitis C virus infection is a major cause of hepatocellular carcinoma worldwide⁽¹¹⁾. Investigating the prevalence and possible risk factors for HBV, HCV, and HIV infections among HD patients is fundamental to develop the evidence base necessary before prevention, treatment, and control plans can be introduced and adopted by both care providers and decision makers to reduce disease prevalence and recirculation, and ultimately reduce rates of morbidity and mortality⁽⁶⁾.

The current study was conducted to investigate the seroprevalence and possible association of HBs Ag, anti-HCV and anti-HIV with demographic, clinical and laboratory variables and duration of hemodialysis among ESRD

patients on HD at the hemodialysis Center at Al-Kindy Teaching Hospital in Baghdad.

PATIENTS AND METHODS:

A cross-sectional study was conducted at the HD center, in Al-Kindy Teaching Hospital in Baghdad. A total of 302 patients with ESRD on HD were evaluated to investigate the prevalence of HBV, HCV and HIV infections and detecting factors associated with their transmission among HD patients. In the period from February to May 2017, after taking patient's consents, blood samples were tested for the presence of hepatitis B surface antigen (HBs Ag), antibodies of HCV (anti-HCV), and antibodies of HIV (anti-HIV). Patients were considered HBV positive if they had the presence of hepatitis B surface antigen (HBs Ag-positive) in their serum. Patients were considered to be HCV positive if they had a positive test result for the presence of antibody by serological testing (anti-HCV-positive), and patients were considered to be HIV positive if they had a positive test result for the presence of antibody by serological testing (anti-HIV-positive). The data included socio-demographic characteristics (age, gender, marital status, and occupation), and possible associated factors for HCV, HBV and HIV infection including; duration on HD, number of blood transfusions, previous surgery, history of tattoos, injected drug user, suspicious sexual contact, previous dialysis in another center, history of kidney transplantation, when hepatitis diagnosed, and the laboratory confirmatory results. Statistical analysis was done using the SPSS statistical package for social sciences version 21. Data were presented as a mean± standard deviation for quantitative variables and as number and percentage for qualitative variables. Differences between groups were evaluated with student's t-test to compare two groups. Qualitative data relations were analyzed by Chi-square test & Fisher exact test when indicated. The p-value of ≤ 0.05 was considered statistically significant.

RESULTS:

In this study, 302 patients from hemodialysis center in Al-Kindy Teaching Hospital in Baghdad, Iraq were enrolled. There were 176/302 (58.27%) males and 126/302 (41.72%) females with a male: female ratio of 1.4:1. The Patients ages ranged from 18 to 86 years, and the mean age for all patients was 51.06 ± 15.15 SD years. Most patients were in the age group 41-60 years, males, married and not workers as shown in Table -1. Four (1.3%) subjects including 1 females and 3 males had positive HBs Ag. One (0.3%) male had anti-HIV Ab, and anti-HCV Ab was positive in 140/302 (46.4%) patients i.e. the prevalence of HCV in patients with ESRD on HD was (46.4%). Among patients with HCV; 81/140 (57.9%) were males and 59/140(42.1%) were females. There was no significant association between HCV infection and sociodemographic characteristics as shown in Figure -1. Causes for renal failure in HCV patients were; hypertension in 44/140 (31.4%), diabetes mellitus in 34/140 (24.3%), renal causes in 21/140 (15%), congenital in 15/140

(10.7%), and unknown cause in 26/140 (18.6%). Out of 140 patients infected with HCV; only 2 (0.14%) were diagnosed with HCV before dialysis and 138 (98.57%) were diagnosed after dialysis. There was no significant association between HCV infection and cause of renal failure and family history of chronic disease, as shown in Table -2. There was a significant association between HCV infection and each of duration of renal failure, duration of hemodialysis and history of surgery, as shown in Table- 3. There was a significant difference in the mean number of blood transfusions and hemodialysis duration, serum creatinine and hemoglobin levels between HCV and non-HCV groups as shown in Table -5. There was no significant association between HCV infection and family history of chronic diseases or renal failure cause, HD in other centers or renal transplantation, tattoo, sex contact, drug abuse. No significant difference was found in blood urea and serum electrolytes between HCV infected and non-infected patients.

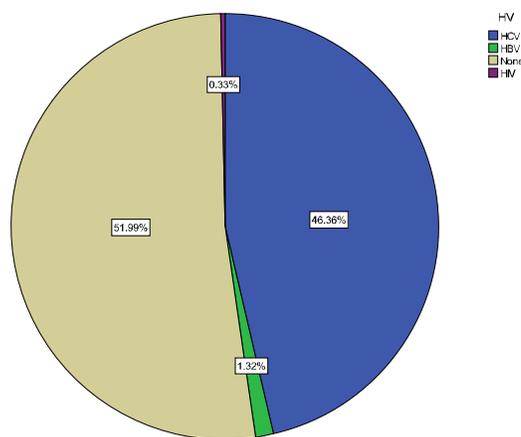


Figure 1: The prevalence of Hepatitis C Virus (HCV), Hepatitis B Virus (HBV), and Human Immunodeficiency Virus (HIV) infection among Hemodialysis (HD) patients (n=302) in Al-Kindy Teaching Hospital, Baghdad, 2017

PATIENTS ON HEMODIALYSIS VIROLOGY STUDY

Table 1: Sociodemographic characteristics of anti-HCV positive patients and negative patients:

Characteristics		HCV(140)		Non-HCV(157)		P value
		No	%	No	%	
Age group	<21y	3	60	2	40	0.799
	21-40y	36	50.7	35	49.3	
	41-60y	59	44.7	73	55.3	
	>60y	42	47.2	47	52.8	
Gender	Male	81	47.1	91	52.9	0.539
	Female	59	47.2	66	52.8	
Marital	Married	92	43.4	120	56.6	0.193
	Widow	22	57.9	16	42.1	
	Single	23	57.5	17	42.5	
	Divorced	3	42.9	4	57.1	
Occupation	Employed	48	43.2	63	56.8	0.179
	Unemployed	92	49.5	94	50.5	

Table 2 : The association between Hepatitis C infection and family history of a chronic renal disease and renal failure cause in the patient with ESRD on HD therapy in Baghdad

		HCV (140)		Non- HCV (157)		P value
		No	%	No	%	
Family history of Chronic disease	Diabetes mellitus (DM)	14	32.6	29	67.4	0.08
	Hypertension (HT)	49	58.3	35	41.7	
	Renal disease	6	42.9	8	57.1	
	HT+DM	23	46.9	26	53.1	
	None	48	44.9	59	55.1	
Cause Renal Failure	Diabetes mellitus	34	40	51	60	0.06
	Hypertension	44	60.3	29	39.7	
	Renal disease	21	50	21	50	
	Congenital	15	50	15	50	
	Unknown	26	38.8	41	61.2	

PATIENTS ON HEMODIALYSIS VIROLOGY STUDY

Table 3: The association between Hepatitis C infection and clinical characteristics and hemodialysis treatment in the patient with ESRD on HD therapy in Baghdad.

		HCV (140)		Non- HCV (157)		P value
		No	%	No	%	
Duration of Renal failure	<2 years	53	30.6	120	69.4	0.005
	2-<4 years	50	67.6	24	32.4	
	=>4 years	37	75.5	12	24.5	
Duration of Hemodialysis	<2 years	69	33.8	135	66.2	0.0001
	2->4 years	50	70.4	21	29.6	
	=>4 years	21	95.5	1	4.5	
Hemodialysis in other Center	Yes	55	51.4	52	48.6	0.16
	No	85	44.7	105	55.3	
Surgery	Yes	55	57.3	41	42.7	0.01
	No	85	42.3	116	57.7	
Renal transplant	Yes	11	68.8	5	31.2	0.06
	No	129	45.9	152	54.1	

Table 4: The association between Hepatitis C infection and possible risk factors in the patient with ESRD on HD therapy in Baghdad.

		HCV (140)		Non- HCV (157)		P value
		No	%	No	%	
Tattoo	Yes	32	55.2	26	44.8	0.11
	No	108	45.2	131	54.8	
Sexual contact	Yes	1	50.0	1	50.0	0.72
	No	139	47.1	156	52.9	
Drug abuse	Yes	1	25.0	3	75.0	0.35
	No	139	47.4	154	52.6	

Table 5: Differences in hematological and biochemical values in HCV hepatitis and none HCV hepatitis patients:

	HCV (140)		Non- HCV (157)		P value
	Mean	±SD	Mean	±SD	
Blood Urea	167.75	±62.07	178.44	±63.25	0.14
Serum creatinine	7.61	±3.70	9.63	±10.02	0.02
Serum calcium	7.78	±0.70	7.64	±1.02	0.19
Serum potassium	5.15	±1.01	5.02	±0.83	0.22
Serum phosphate	5.12	±0.97	5.06	±1.22	0.62
Hemoglobin	9.17	±1.92	8.25	±1.52	0.005
No. of Blood transfusions	2.84	±3.69	0.92	±1.74	0.0001
HD duration (Years)	2.17	±1.63	0.73	±0.82	0.0001

DISCUSSION:

The prevalence of viral hepatitis is higher in patients on HD than in the general population affecting the quality of life and mortality rate among patients. The overall prevalence was 46.4% for hepatitis C, 1.3% for HBs Ag, and 0.3% for anti-HIV. The HBV result agrees with Hassan et. al. in Karbala (2015), HIV result agrees with David, et. al. in Europe (2003), and HCV result agrees with Salwa, et. al. in Basrah (2014).^(12, 13, 14) Seroprevalence of HBs Ag among HD patients in this study, is lower than the prevalence of HBV among HD patients in Turkey (11.8%) reported by Yakar Yilmaz, et. al. (2006) and in Iran (50%) reported by Zahedi, et. al. (2012).^(15, 16) The lower prevalence of HBs Ag may be attributed to the strict control by hepatitis B vaccination in Iraq. The prevalence of HCV in this study (46.4%) is higher than in others such as in Iran (7%) by Zahedi, et. al. (2012), in KSA (14.7%) by Almawi, et. al. (2004) in Turkey (20.2%), by Yakar Yilmaz, et. al. (2006) and in Jordan(23%) by Al-Jamal, et. al. (2009).^(15,16,17,18) This difference may be attributed to contaminated equipment, surfaces, and HCV infected patients in addition to contaminated healthcare worker hands that are considered among the most common modes of transmission of nosocomial infections. This difference may also be attributed to inadequate hematological investigations such as PCR for HCV mainly on blood and blood products as the mean number of blood transfusions in HCV infected group is significantly higher than the non-HCV group.⁽¹⁹⁾ For anti-HIV the prevalence is higher than Iran by Zahedi, et. al. (2012) & Japan by Goodkin, et. al. (2003) which was 0%, and lower than the USA by Goodkin, et. al. (2003) which was 1.1%.^(14, 15) Out of 297 patients (after excluding 4 HBV and one HIV infected patients from the analysis); 140 were infected with HCV, 57.9% were males and 52.1% were females. Male sex had a statistically significant association with anti-HCV positivity than female and the explanation for this finding is that the risk of exposure is probably higher in males than in females due to occupational factors, travel, social differences that are probably more common among the male population. This result is consistent with other study done in Pakistan (2011) where the male sex is more than female sex,⁽²⁰⁾ Among the studied patients; 59 (42.1%) were in the age group of 41-60 years, and most of them were married 92 (65.7%), unemployed 92 (65.7%). These results agree with Ramzi et al study in Sulaimanya (2010) but the majority of them in

the age group of (50-59).⁽²¹⁾ Associated factors for HCV infection in HD patients include the history of blood transfusions, duration of HD, previous dialysis in another center, and history of previous surgery, kidney transplantation, intravenous drug use and other factors. Among all factors studied, duration of renal failure, duration of HD, renal failure cause and history of surgery, creatinine and Hemoglobin levels were significantly associated with HCV positivity. These results disagree with another study in Iran (2005) and in Jordan (2009) in which all the above factors have no association with HCV antibody positivity except HD duration which has a significant association with HCV antibody positivity. Many studies indicate that the prevalence increases with longer duration on dialysis, such as Bdour, et. al. 2002 in Jordan, and Hassan, et. al. (2015) in Karbala.^(22, 23) Hamissi, et. al. (2011) also reported that the presence of HCV infection among HD patients was associated with the duration on HD.⁽²³⁾ Analysis for HCV infection among patients under HD therapy revealed a significant with the number of blood transfusions at the p-value of (0.0001) between HCV and non HCV patients. This result agrees with Reddy, et. al. (2005) who reported that the HD patients are at high risk for viral hepatitis infections due to the high number of blood transfusions.⁽²⁴⁾ Galperim, et. al. (2010) showed a positive HCV independently associated with being on HD for more than five years⁽²⁵⁾ Zaki, et. al. study (2014) revealed a significant association between the duration of HD and the numbers of transfused blood.⁽²⁶⁾ Other studies reported that HD for more than two years was noted to be a significant risk factor for acquiring viral hepatitis infections.^(27, 28) Though HCV infected patients in this study were more 55/107 (51.4%) among those who did HD in other hospitals than non HCV group 52/107(48.6%) but this difference was not statistically significant but Su, et. al. (2013), and Ramzi, et. al. (2010) demonstrated that among the factors for HCV infection was attending more than one dialysis unit.^(29, 30)

CONCLUSION AND RECOMMENDATIONS:
The prevalence of HBV & HIV infections were low and the prevalence of HCV was high in the HD Center in Al-Kindy Teaching Hospital in Baghdad. HCV infection was related to the number of blood transfusions, longer duration of HD, longer duration of renal failure, history of surgery, creatinine and Hemoglobin levels.

The study recommends local guidelines emphasizing on blood safety strategies, implementation of infection control practices in collaboration with expert nephrologists, epidemiologists, and infection control specialists, and implementation should be monitored regularly. In addition to stronger adherence to infection control practices in dialysis units, the use of erythropoiesis - stimulating agents instead of blood transfusions may help in reduction of prevalence of HCV infection in the HD patient.

REFERENCES:

1. Halle M, Luma H, Temfack E, et al. Prevalence of Hepatitis B Surface Antigen and Anti- HIV Antibodies among Patients on Maintenance Hemodialysis in Douala – Cameroon. *Journal of Health Sci. Dis* 2013; 14 (3): 1-5.
2. Toosil M, Larti F, Seifei S, and Abdollahi A. Prevalence of viral hepatitis in hemodialysis patients in Tehran, Iran; *Journal of Gastrointestinal and Liver Disease*; 2008, 17(2): 233.
3. Zahedi M, Moghaddam S, Alavian S, Dalili M, and Mon H. Seroprevalence of Hepatitis Viruses B, C, D and HIV Infection Among Hemodialysis Patients in Kerman Province, South-East Iran. *Hepatitis Monthly* 2012; 12(5): 339-343.
4. Mina P, Georgiadou S, Rizos Ch, Dalekos G, and Rigopoulou E. Prevalence of occult hepatitis B virus infection in hemodialysis patients from central Greece; *World Journal of Gastroenterol* 2010; 16(2): 225-231.
5. Shihab S, Al-Hmudi H, Al-Edani H, and Mahdi K. Viral hepatitis Basrah hemodialysis unit: Serological diagnosis and viral loading; *European Journal of Experimental Biology* 2014, 4(2): 106-112.
6. Gasim G, Hamdan H, and Adam I. Epidemiology of Hepatitis B and Hepatitis C Virus Infections among Hemodialysis Patients in Khartoum, Sudan. *Journal of Medical Virology* 2012; 84: 52–55.
7. El-Ottol A, Elmanama A, and Ayes B. Prevalence and risk factors of hepatitis B and C viruses among hemodialysis patients in Gaza strip, Palestine; *Virology Journal* 2010; 210 (7): 1-7.
8. Reddy G, Dakshinamurthy K, Neelaprasad P, Gangadhar T, and Lakshmi V. Prevalence of HBV and HCV dual Infection in Patients on Hemodialysis; *Indian Journal of Medical Microbiology* 2005; 23 (1): 41-43.
9. Telaku S, Fejza H, Elezi Y, and Bicaj T. Hepatitis B and C in dialysis units in Kosova. *Virology Journal* 2009, 72 (6): 1-4.
10. Hamissi J, and Hamissi H. Occurrence of hepatitis B and C infection among hemodialyzed patients with chronic renal failure in Qazvin, Iran: A preliminary study. *International Journal of Collaborative Research on Internal Medicine & Public Health* 2011; 3(1): 89-96.
11. Baumert TF, Jühling F, Ono A, Hoshida Y. Hepatitis C-related hepatocellular carcinoma in the era of new generation antivirals. *BMC Med.* 2017; 15(1):52
12. Jasim, Hassan A, Nabeel A. "Prevalence and Risk Factors for Hepatitis C and B Viruses Infection among Hemodialysis Patients in Holy Karbala, Iraq." *Kufa Journal for Nursing Sciences* 2015; 5 (3): 24-33
13. Shihab, Salwa S. "Viral hepatitis infections in Basrah hemodialysis unit: serological diagnosis and viral loading." *European Journal of Experimental Biology* 2014; 4 (2): 106-12.
14. Goodkin, David A. "Association of comorbid conditions and mortality in hemodialysis patients in Europe, Japan, and the United States: the Dialysis Outcomes and Practice Patterns Study (DOPPS)." *Journal of the American Society of Nephrology* 2003; 14(12): 3270- 3277.
15. Yakar Yilmaz, Fahri. "Prevalence of occult hepatitis B and hepatitis C virus infections in Turkish hemodialysis patients." *Renal failure* 28.8 (2006): 729-735. A1
16. Zahedi, Mohammad Javad. "Seroprevalence of hepatitis viruses B, C, D and HIV infection among hemodialysis patients in Kerman Province, South-East Iran." *Hepatitis monthly* 2012; 12. (5): 339.
17. Hijazi, Munther, Yousef M. "Hepatitis B

- infection among patients receiving chronic hemodialysis at the Royal Medical Services in Jordan." *Saudi Journal of Kidney Diseases and Transplantation* 2008; 19 (2): 260.
18. Al-Jamal, Mohammed. "HCV infection in hemodialysis patients in the south of Jordan." *Saudi Journal of Kidney Diseases and Transplantation* 2009; 20 (3): 488.
19. Karkar A. Infection control guidelines in hemodialysis facilities *Kidney Res Clin Pract.* 2018; 37(1):1-3
20. Idrees, Muhammad K, Salma B, and Ejaz A. "Hepatitis B virus among hemodialysis patients: a report from Karachi, Pakistan." *Age (years)* 2011; 34: 12-68.
21. Ramzi, Zhian S, "Prevalence and risk factors for HCV infection in hemodialysis patients in Sulaimani." *Zanco Journal of Medical Sciences* 2010; 14(1): 44-50.
22. Bdour, Salwa. "HCV infection in Jordanian hemodialysis units: serological diagnosis and genotyping." *Journal of medical microbiology* 2002; 51(8): 700-704.
23. Hamissi J, and Hamissi H. Occurrence of hepatitis B and C infection among hemodialyzed patients with chronic renal failure in Qazvin, Iran: A preliminary study. *International Journal of Collaborative Research on Internal Medicine & Public Health* 2011; 3(1): 89-96.
24. Reddy G, Dakshinamurthy K, Neelaprasad P, Gangadhar T, Lakshmi V. Prevalence of HBV And HCV dual Infection in Patients on Hemodialysis. *Indian Journal of Medical Microbiology* 2005; 23 (1): 41-43.
25. Galperin A, Mattos A, Stein A.et al. Hepatitis C in hemodialysis: the contribution of injection drug use. *Braz J Infect Dis* 2010; 14(4): 422-426.
26. Zaki M, Rafaat D, Eliwa A, Abdelsalam M.; Occult Hepatitis B among Patients under Hemodialysis at Mansoura University Hospitals: Prevalence and Risk Factors. *Journal of Virology & Antiviral Research* 2014; 3(1): 1-6.
27. Al Hijazi M, and Ajlouni Y. Hepatitis B Infection among Patients Receiving Chronic Hemodialysis at the Royal Medical Services in Jordan; *Saudi J Kidney Dis Transpl* 2008; 19(2): 260-26
28. Zarkoon H, Shah K, Rehman H, Daud A, Ahmed J. Hepatitis C Virus Infection in Patients on Long-Term Hemodialysis. *Gomal Journal of Medical Sciences* 2008; 6(1): 1-4.
29. Ramzi Z, Abdulla A, AL-Hadithi T, and Al-Tawil N. Prevalence and Risk Factors for Hepatitis C Virus Infection in Hemodialysis Patients in Sulaimani *Zanco J. Med. Sci.* 2010; 14(1): 44-50.
30. Su Y, Yan R, Duan Z. Prevalence and risk factors of hepatitis C and B virus infections in hemodialysis patients and their spouses: A multicenter study in Beijing, China; *J. Med. Virol.* 2013; 85: 425–432.