

Renal manifestations of hepatitis C in community-dwelling adults: NHANES 1999-2006

Rajiv Gandhi, MD, Robert Foley, MD, MSc

United States Renal Data System, Minneapolis Medical Research Foundation, University of Minnesota Twin Cities

Introduction

- Hepatitis C virus (HCV) infection is the most common chronic bloodstream infection in the United States (US).
- Approximately 80% of those who acquire infection become chronic carriers, totaling approximately 3.2 million persons in the US. Until 1992, transmission commonly occurred by transmission of blood products; improved screening practices then decreased transmission. More recently, intravenous drug use has been the most common risk factor for infection.
- While the incidence of new cases is decreasing, a significant number of cases go undiagnosed. In 2007, only 849 confirmed cases of HCV were reported in the United States, but the Centers for Disease Control and Prevention (CDC), after adjusting for asymptomatic infection and underreporting, estimates that approximately 17,000 new cases of HCV occurred.
- Although hepatitis C infection (HCV) and chronic kidney disease (CKD) are common, the renal manifestations of HCV in non-referred, community-dwelling adults are not well described.

Methods

- The National Health and Nutrition Examination Survey (NHANES) is a cross-sectional representative sample of all non-institutionalized adults in the United States.
- NHANES participants age 20 years and older who were interviewed, examined, and tested with nonambiguous results for HCV serology and serum creatinine from 1999 to 2006 were included (n=13,211).
- Statistical comparisons were weighted for the survey design employed. SAS statistical software (version 9.1) was used in analysis. First, the general population was characterized by demographic, examination, laboratory, and questionnaire variables. Participants were subsequently compared on these same factors by hepatitis C antibody status. The means by group are given in the table.

Results

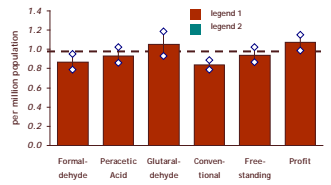
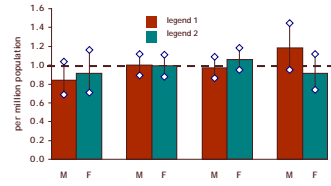
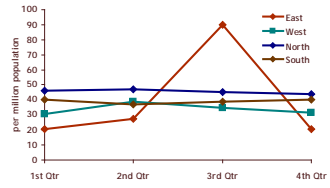
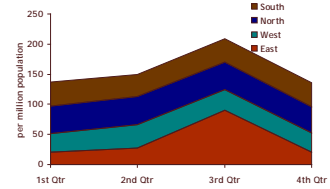
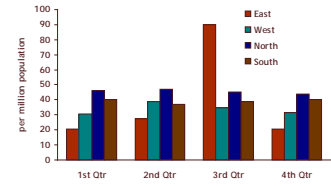
- 1.9% of US adults were HCV-positive. Although HCV-positive and HCV-negative subjects were of similar age, mean eGFR (92.9 vs. 87.7), ACR (71.2 Vs. 26.2) and diastolic BP (74.0 Vs. 71.8) were higher (P < 0.05) in subjects with HCV. In a multivariate analysis, HCV-positivity was associated with higher ACR and diastolic BP, but no association with eGFR was present; other associations of HCV-positivity included male gender, African-American race, lower BMI, lower level of school education, blood transfusion and smoking.

Table 1. Characteristics of the NHANES general population of adults age ≥ 20 years included in analysis

	General	HCV-	HCV+	p	
N (persons)	12,653	12,414	245		
Age (y)	45.9 (SE=0.3)	45.9 (0.3)	46.6 (1.6)	0.67	
Gender M/F (%)	48.1/51.9 (<.1)	47.8/52.2 (<.1)	62.1/37.9 (5.5)	<.05	
Blood pressure (mm Hg)					
Systolic	123.0 (0.3)	123.1 (0.3)	122.4 (1.4)	0.63	
Diastolic	71.8 (0.2)	71.8 (0.3)	74.0 (0.9)	<.05	
Body Mass Index (kg/m ²)	28.1 (0.1)	28.1 (0.1)	26.7 (0.4)	<.05	
Serum					
Creatinine (mg/dL)	0.90 (<.01)	0.90 (<.01)	0.88 (.02)	0.40	
eGFR (mL/min/1.73m ²)	87.8 (0.5)	87.7 (0.5)	92.9 (2.3)	<.05	
eGFR < 60 (%)	7.7 (0.4)	7.7 (0.4)	6.0 (2.2)	0.49	
Bicarbonate (mmol/L)	24.1 (0.1)	24.1 (0.1)	24.0 (0.2)	0.50	
Phosphorus (mg/dL)	3.6 (<.1)	3.6 (<.1)	3.7 (<.1)	0.53	
Calcium	9.5 (<.1)	9.5 (<.1)	9.4 (<.1)	<.05	
Glucose (mg/dL)	100.9 (0.5)	100.9 (0.5)	104.0 (3.9)	0.44	
Cholesterol (mg/dL)	202.3 (0.7)	202.4 (0.7)	194.6 (5.6)	0.17	
Uric acid (mg/dL)	5.4 (<.1)	5.4 (<.1)	5.6 (0.1)	0.14	
ALT (U/L)	26.2 (0.4)	25.7 (0.4)	53.5 (5.1)	<.05	
Urine Alb-Cr Ratio (mg/g)	27.1 (2.2)	26.2 (2.2)	71.2 (18.4)	<.05	
Seropositivity (%)					
Hepatitis C	1.9 (0.2)	0 (0)	100 (0)		
HIV	0.4 (<.1)	0.4 (<.1)	0.9 (0.5)	0.08	
History (%)					
Prior blood transfusion	11.4 (0.4)	11.2 (0.4)	23.5 (4.1)	<.05	
Hypertension	26.9 (0.8)	26.8 (0.8)	33.7 (4.3)	0.10	
Diabetes mellitus	6.7 (0.3)	6.7 (0.4)	7.7 (2.9)	0.73	
Current smoker	48.9 (1.2)	47.9 (1.2)	76.4 (4.5)	<.05	
Prior intravenous drug use	9.1 (1.1)	4.5 (0.9)	62.2 (4.1)	<.05	

Conclusions

- HCV positivity is associated with
 - Male gender
 - Higher diastolic blood pressure
 - Lower BMI
 - Higher eGFR
 - Higher UACR
 - Higher ALT
- HCV positivity is strongly associated with history of traditional risk factors such as prior blood transfusion and IV drug use.
- Proteinuria and hypertension, with preserved eGFR, are the cardinal renal manifestations of HCV in community-dwelling adults.



10 point

graphs with confidence intervals: the bars have to be colored by hand, and the x-axis labels (if long), line at 1.0, and legend have to be made outside of the graph

TABLES: Please do not use the space bar to align numbers in columns; the numbers will not print properly. If you aren't sure how to set the tabs to create columns, just ask Ed or Sue; we'll be happy to show you.

Group #	1	2	3	4	5	6
Race	white	white	white	white	white	white
Gender	male	male	male	male	male	male
Age	45-64	45-64	45-64	45-64	45-64	45-64
ESRD years	0	0	0	0	0	0
Diabetes	no	yes	yes	yes	yes	yes
Comorbidity	no	no	PVD	PVD	PVD	PVD
Hosp. days	0	0	0	11-20	11-20	11-20
Blood trans.	0	0	0	0	3+	3+
Vascular acc.	0	0	0	0	0	2
