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BRIEF REPORT

Hepatitis C Virus Is Associated With Increased Mortality Among Incarcerated Hospitalized Persons in Massachusetts

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Hepatitis C virus (HCV) is curable, but incarcerated populations face barriers to treatment. In a cohort of incarcerated hospitalized patients in Boston, Massachusetts, HCV infection was associated with increased mortality. Access to HCV treatment in carceral settings is crucial to avoid unnecessary death and to support HCV elimination efforts.

Keywords. hepatitis C; jail; prison; liver disease; incarcerated.

Incarcerated populations face barriers in accessing hepatitis C virus (HCV) treatment. The profound impact of curative HCV treatment in 2013 is clear, with decreased incidence of cirrhosis and hepatocellular carcinoma [1, 2]. Access to HCV treatments in carceral settings is limited [3, 4]. The prevalence of HCV is 2% in the US general population compared with estimates as high as 70% in incarcerated populations who report injection drug use [5–7]. Racial and ethnic minoritized populations, including Black and Latinx people, comprise the majority (>60%) of HCV cases in US jails and prisons [8]. The literature on HCV-related mortality among carceral populations is predominantly from inmates in Texas recruited from 1994 to 2003 and shows high rates of HCV-related mortality, especially in Black and Hispanic people [9–13]. The goal of this study was to examine the impact of HCV on 2-year post-hospitalization mortality among incarcerated persons hospitalized at Lemuel Shattuck Hospital (LSH), a public health hospital outside of Boston, Massachusetts, that is the preferred inpatient facility for incarcerated persons in jails or prisons in Massachusetts.

METHODS

Data Source and Study Sample

We analyzed all incarcerated persons who were hospitalized at LSH from 2011 to 2016. Incarceration status was confirmed through specific insurance codes linked to the admission. We collected demographic data, length of stay, and International Classification of Diseases, 9th Revision and 10th Revision (ICD-9 and 10), codes associated with the admission. Race and ethnicity were drawn from the electronic medical record and guided by previously published research methods [14]; missing ethnicity data were supplemented by review of notes in medical records and patient names. We excluded persons who had admissions >60 days given as likely representing rehabilitative admissions rather than acute care hospitalizations. We excluded persons with incomplete race or ethnicity data. We linked the hospital data to the Massachusetts Department of Public Health Registry of Vital Records and Statistics through December 31, 2018. The outcome of interest was death within 2 years of hospitalization.

Patient Consent

Our study did not include identifiable data that required individual informed consent, as we used secondary data collection methods. The Massachusetts Department of Public Health Institutional Review Board approved this study.

Statistical Analysis

We performed univariate and multivariable analyses using a Cox proportional hazard model. Time at risk was defined as the period between the participant's first admission during 2011–2016 at LSH and death, or the end of 2-year follow-up period (12/31/2018). Covariates found to be statistically significant ($P < .05$) in the univariate analysis were included in the multivariable model. The primary exposure of interest was HCV, indicated by the presence of HCV ICD-9/ICD-10 codes. Covariates included were age at admission, race (White, Black, or other), ethnicity (Hispanic or non-Hispanic), gender (male or female), Elixhauser Comorbidity [15, 16], admission time period (2011–2014 or 2015–2016, chosen specifically as pre/post–dissemination of all oral HCV treatment), number of hospitalizations (1 or >1), and whether the inmate was coming from jail (House of Corrections [HOC]) or prison (Department of Corrections [DOC]). All analyses were performed using STATA 16.

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RESULTS

Of 2238 incarcerated individuals who were hospitalized between 2011 and 2016, 372 died. Excluding people with hospitalizations >60 days (n = 30) and incomplete race/ethnicity data (n = 155), the final cohort included 2053 people. The average age was 46; the cohort was 91% male, 62% White, and 16% Hispanic; 9.5% (n = 178) died within 2 years of hospitalization (Table 1). In the univariate analysis, HCV, age, race, ethnicity, Elixhauser Comorbidity Index score, and increased hospitalizations were significantly associated ($P < .05$) with 2-year mortality and were included in our multivariable analysis. In the multivariable analysis, HCV (hazard ratio [HR], 1.61; 95% CI, 1.17–2.12), older age (HR, 1.57; 95% CI, 1.39–1.77), and increased Elixhauser Comorbidity Index score (HR, 1.10; 95% CI, 1.08–1.12) were associated with death. Black people had a decreased risk of mortality when compared with White people (HR, 0.60; 95% CI. 0.41–0.89) (Table 1).

DISCUSSION

With highly effective all-oral treatment approved in 2013 for the treatment of HCV, no one should be dying of HCV-related causes. Expanding testing and treatment in incarcerated populations must be a priority for medical care in carceral settings to save lives and to bring the world closer to HCV elimination [17]. In this cohort of incarcerated persons hospitalized at LSH between 2011 and 2016, 15% of people with HCV died within 2 years after hospitalization. HCV was associated with a 61% increased risk of 2-year mortality even after controlling for severity of disease. Although there is no literature available for a direct comparison of HCV-related mortality, data collected through the Chronic Hepatitis Cohort Study (CHeCS) reported that in a cohort of people with HCV (mean age, 51 years), 9% died during the follow-up period of 5 years [18]. Our similarly aged population had a higher mortality over a shorter period of time. Also from the CHECS study, about 15% of people with HCV who did not receive HCV treatment died in the 4 years from 2014 to 2017 [19]. The population of people with HCV who were incarcerated and hospitalized had a similar mortality as people who did not receive HCV treatment.

Treatment of HCV decreases mortality in people with and without cirrhosis [20], but there are barriers preventing HCV treatment in jails and prisons. One barrier is the cost of HCV medications, which can range from $26 000 to $32 000 per treatment course [21]. Previous work by our group found that

Table 1. Demographic-, Disease-, and Hospitalization-Related Factors Associated With 2-Year Mortality Among Inmates Admitted to Lemuel Shattuck Hospital (n = 2053)

Variable	Deceased		Univariate			Multivariable		
	No (n = 1875)	Yes (n = 178)	HR	95% CI	*P* Value	HR	95% CI	*P* Value
Hepatitis C, No. (%)								
No	1429 (93)	102 (7)	Ref	-	<.0001	Ref	-	.003
Yes	446 (85)	76 (15)	2.28	1.69–3.07		1.61	1.17–2.21	
Admit year, No. (%)								
2011–2014	1519 (91)	145 (9)	Ref	-	.897			
2015–2016	356 (92)	33 (8)	0.97	0.69–1.42				
Age, mean (SD), y	45 (14)	57 (13)	1.78	1.61–1.99	<.0001	1.57	1.39–1.77	<.0001
Gender, No. (%)								
Female	172 (94)	11 (6)	Ref	-	.182			
Male	1703 (91)	167 (9)	1.52	0.82–2.79				
Race, No. (%)								
White	1137 (89)	134 (11)	Ref	-	<.0001	Ref	-	.012
Black	506 (94)	32 (6)	0.55	0.37–0.81		0.6	0.41–0.89	
Other	232 (95)	12 (5)	0.46	0.25–0.82		0.54	0.26–1.10	
Hispanic, No. (%)								
No	1561 (91)	161 (9)	Ref	-	.016	Ref		.859
Yes	314 (95)	17 (5)	0.54	0.33–0.89		1.06	0.57–1.94	
Inmate status, No. (%)								
DOC	1343 (91)	137 (9)	Ref	-	.12			
HOC	532 (93)	41 (7)	0.76	0.53–1.07				
Elixhauser score, mean (SD)	17.7 (4.8)	23.7 (7.8)	1.13	1.11–1.15	<.0001	1.1	1.08–1.12	<.001
No. of hospitalizations (%)								
1	1308 (94)	91 (6)	Ref	-	<.0001	Ref	-	.772
>1	567 (87)	87 (13)	2.09	1.56–2.80		1.05	0.76–1.43	

Significance at $P < .05$.

Abbreviation: HR, hazard ratio.

incarcerated people with HCV who were hospitalized were more likely to be readmitted, increasing health care costs [22]. Other barriers to HCV treatment include stigma against people with HCV and concerns about the ability to treat HCV when persons may be incarcerated for brief periods of time before returning to the community [23]. Although prisons have rolled out more comprehensive HCV treatment programs, coordination of HCV treatment in jails is problematic as detained people often have short or uncertain periods of detainment. There is increasing evidence that people who are in jail can be successfully treated with HCV medications, even when they are discharged mid–treatment course [24].

Black race was associated with decreased risk of death in both the univariate and multivariate analyses—a difference, but not in the direction we hypothesized. Racial disparities exist both with disproportionately elevated incarceration rates in Blacks and Hispanics [25] and decreased access to HCV care for Blacks and Hispanics in the community [26]. The synergy of decreased access to HCV care inside and outside of prison has precipitated high rates of HCV-related mortality in incarcerated persons, especially for Blacks, Latinx people, and other minoritized populations [13]. The explanation for our finding that Black race was associated with decreased risk of death is unclear. Postrelease mortality rates are high across races for multiple reasons, such as untreated opioid use disorder and other chronic health care conditions including hypertension and diabetes [27]. Black people have longer incarceration periods [28], so one possible explanation for our finding is that Black people were incarcerated for longer periods of time, leading to decreased risk of death from overdose or untreated chronic illness in the community following release. Arguing against the concept of incarceration as decreasing risk of death, there are data that the stress associated with being incarcerated leads to premature aging [29].

There were several limitations to this study. We were unable to determine from ICD-9/-10 codes whether people had active, treated, or cleared HCV infection, and further research is necessary to assess whether the presence or absence of treated HCV is directly linked to changes in mortality. We do not know if people were incarcerated when they died or their length of incarceration before death. Additionally, our cohort was limited to persons who were hospitalized at LSH, so the cohort may miss (1) people who died at the jail/prison, (2) people hospitalized at a tertiary care hospital who were released back to prison/jail, and (3) people who were hospitalized at tertiary care hospitals who died, if any of these 3 groups were never hospitalized at the Lemuel Shattuck Hospital. Any racial differences in these 3 groups may have led to differential capturing of people in the original cohort. There is evidence from the community literature, especially with COVID-19, that Black people present to health care with more advanced illness [30]. Outside of national efforts tracking COVID-19 cases and deaths in jails and prisons [31], there is no current system in the United States to track hospitalizations or deaths for people who are incarcerated. There are limited data on how many deaths occur per year among people in prisons and jails for comparison. The state of Massachusetts does not track jail deaths; however, the Bureau of Justice Statistics reported 306 deaths in federal and state prisons in Massachusetts between 2011 and 2018 [32]. We believe that our methods, albeit with limitations, are an approximation of the total number of people who were hospitalized while incarcerated and died within 2 years.

Despite these limitations, we accessed a unique database to investigate HCV-related mortality in a population of hospitalized and incarcerated persons, revealing that HCV was associated with death within 2 years of hospitalization. Further research and advocacy are needed to decrease barriers to HCV testing and treatment in carceral settings and move toward HCV elimination.

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