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Viral Hepatitis C and Its Distribution in Delaware

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With an estimated three million people living with hepatitis C virus infection (HCV), HCV infections are the most common blood-borne infections in the united States.[1] Recent state surveillance reports for the period of 2006-2012 showed a nationwide increase in the number of reported cases of acute HCV infection, with the largest increases occurring in the Mississippi river basin, especially among states in central Appalachia.[2]

In addition, an emerging epidemic of HCV infection among persons who inject drugs (PWIDs) has increased sharply in several areas throughout the United States, with most newly diagnosed HCV cases associated with injection drug use[3] and many of the persons living with HCV unaware of their infection. As a result, these individuals do not receive preventive services and appropriate treatment.[1] Although Delaware had more than 3,500 persons living with HIV (human immunodeficiency virus) in 2015, and around 2,750 PWIDs in 2013,[4,5] data on the burden of HCV infection in Delaware are still unknown. To better understand the status of HCV infection in Delaware, we aim at (i) establishing the prevalence of HCV infection in Delaware; (ii) identifying accessibility of Delawareans to HCV laboratory testing and diagnosis; (iii) determining characteristics of individuals who have been infected with HCV in Delaware.

Methods

Surveillance data for HCV infection from the Delaware Electronic Report Surveillance System (DERSS) for the period from January 1, 2016 through March 31, 2016 were examined. We conducted a retrospective review of surveillance reports on HCV infection reported by hospitals and laboratories in Delaware to DERSS. Data on the patients' demographics and laboratory testing results were reviewed. During that time period, 789 suspected cases of HCV were abstracted from the DERSS and included in our analysis. The patients were classified based upon the Council of State and Territorial Epidemiologists (CSTE) case definition for HCV infection.[6] Due to a small sample of cases with acute HCV, and to increase data validity, analyses for both groups (acute and chronic HCV infections) were performed together. Calculation of HCV prevalence was based on the number of HCV cases diagnosed as either probable or confirmed cases according to the CSTE case definition. Descriptive statistics such as frequencies, means, medians, and cross-tabulation were used for patient characteristics. Data analysis were performed using the Stata© software program (version 13; Stata Corp., College Station, TX). Probability values less than 0.05 (two tailed) were considered statistically significant.

Results

During this three month period, we identified eight (1.0%) persons suspected for acute HCV and 781 (99.0%) for chronic HCV infection, respectively. Baseline characteristics of these 789 persons are presented in Table 1. Of these 789 persons, 470 (59.6%) were HCV-antibody positive, 257 (32.6%) were not a case, 214 (27.1%) were under investigation, and seven (0.9%) were classified as "other" (defined as either missing or did not have enough information for HCV diagnosis). Furthermore, 186 (23.6%) were identified as confirmed and 125 (15.8%) as probable cases, for an overall HCV prevalence of 39.4%.

Table 1. Baseline Characteristics of Suspected Cases of Viral HCV Infections

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Case Identified	Acute HCV (N,%)	Chronic HCV (N,%)	Total
Confirmed	6 (75)	180 (23.0)	186 (23.6)
Probable	1 (12.5)	124 (15.9)	125 (15.8)
Not a case	0	257 (32.9)	257 (32.6)
under investigation	1 (12.5)	213 (27.2)	214 (27.1)
Others*	0	7 (0.9)	7 (0.9)
Total	8	781	789

* Missing or did not have enough information for HCV diagnosis

Of the 470 persons positive for HCV-antibody, 236 (50.2%) had HCV RNA test results for viral HCV. Table 2 represents the characteristics of current HCV infected persons. Of the 311 patients infected with HCV (both acute and chronic), either diagnosed as confirmed or probable cases, the mean age was 39.2 years old (range from 1-85 years). Males accounted for 55.3% (n=172) of all cases. A larger percentage of infected persons was in the age group of 21-40 years (57.9%, n=180), and a majority of infected cases were among White (74.0%, n=230) compared with only 15.4% and 1.6% in Black and Asian/American Indian, respectively. More than 62% (n=193) of infected cases were located in New Castle County (Figure 1), and a large number of cases were in the state's larger cities such as Wilmington, New Castle, Smyrna, Newark, Millsboro, Georgetown, and Dover, with higher concentration in certain zip codes (Table 2).

Figure 1. HCV Infected Cases By County

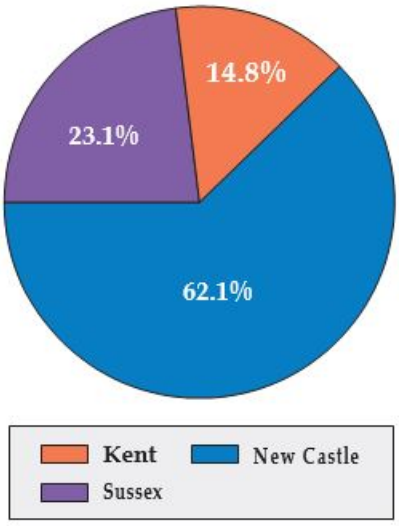

Table 2. Characteristics of Patients Infected with Viral HCV

Characteristics	Number (%) [N=311]
Age, years (range: 1-85; mean 39.2)	
1. 20	11 (3.5)
21-40	180 (57.9)
41-60	84 (27.0)

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> 60	36 (11.6)
Sex (n=311)	
Male	172 (55.3)
female	139 (44.7)
Ethnicity/Race (n=311)	
White	230 (74.0)
Black	48 (15.4)
Other *(Asian, American Indian)*	5 (1.6)
unknown	28 (9.0)
County, city (zip code*) New Castle (n=193)	80 (41.5)
Wilmington (19801,19802,19805)	31 (16.0)
Smyrna (19977)	27 (13.9)
Newark (19702,1911,19713)	30 (15.5)
New Castle (19720)	25 (13.1)
All other cities	17 (37.0)
Kent (n=46)	6 (13.0)
Dover (19901,19904)	5 (10.0)
Felton (19943)	6 (13.0)
Harrington (19952)	12 (26.0)
Magnolia (19962)	19 (26.4)
All other cities	7 (9.7)
Sussex (n=72)	5 (6.9)
Georgetown (19947)	15 (20.9)
Lauren (19956)	7 (9.7)
Lewes (19958)	19 (26.4)
Millsboro (19966)	
Seaford (19973)	
All other cities	

* Only selected zip codes with high number of cases

Discussion

HCV infection is very common in the United States. Preliminary findings from our surveillance data on HCV infection showed the overall HCV prevalence of 39.4% among Delawareans who visited hospitals and some clinics in Delaware for hepatitis symptoms. In 2015, with the population of 941,634 people in Delaware and 311 persons diagnosed with either probable or confirmed cases of viral HCV infection, the prevalence of viral HCV infection in Delaware was 33 persons per 100,000 population. Similarly, with 470 persons positive on HCV-antibody testing, the number of Delawareans who have ever been infected with HCV in Delaware were estimated at 50 persons per 100,000 population. It is important to note that our data were primarily from DERSS surveillance data for HCV infection generated from hospitals and some laboratories. So far, we received very few reports from out-patient clinics in the state, suggesting

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that our prevalence as calculated actually underestimates the actual number of HCV infections. Taken together, these indicators strongly suggest that viral hepatitis C infection is a real public health problem in Delaware. Given that with current treatment regimens HCV infection is curable and treatment is of short duration, it is important to identify HCV-infected persons and link them to care. The high prevalence of HCV infection among Delaware's population indicates a need for additional support and funding for HCV control efforts.

Hepatitis C infection is a major cause of chronic liver disease and hepatocellular carcinoma and the leading indication for liver transplantation in the United States. We observed that only a small number of acute HCV infected patients visited healthcare providers in Delaware (only 1.0% of the total cases). A majority of our patients were missed in their acute phase of infection, and did not know that they had the disease, perhaps because HCV infection is often asymptomatic. However, it is important that a patient infected with HCV knows his/ her disease status since HCV, if left without appropriate treatment, may result in severe complications such as liver cirrhosis and advanced liver disease with liver failure as well as liver cancer. In Delaware, the Division of public health is focusing on HCV testing and screening protocols to include HCV testing among high risk individuals. Results from our study showed that around 62% of infected cases were in New Castle County, where almost 60% of the entire state population live, and a large number of cases were clustered in major cities, with certain zip codes (Table 2). These urban areas should be targeted for the HCV campaign and HCV screening programs.

The current Centers for Disease Control and Prevention guidelines on testing for HCV infection (Figure 2) recommend that persons who are positive for HCV-antibody should be followed up with a test for HCV RNA to detect whether or not the patient is a "current HCV infection" or "no current HCV infection", then be followed up with additional testing as appropriate or linked to care. Of the 470 persons reactive to HCV-antibody in our study, only 236 (50.2%) had HCV RNA test results available, suggesting that among those seeking care for hepatic issues, almost one half did not have adequate access to testing or follow-up for HCV infection. Furthermore, almost 58% of our cases were in the age group of 21-40 years old, they are sexually active. Detecting their disease status and linking them to care and treatment are necessary in order to limit the disease transmission and avoid or reduce HCV-related morbidity, mortality, and expenses that may result from HCV infection.

Figure 2. CDC Recommended Testing Sequence for Identifying Current Hepatitis C Virus (HCV) Infection[7]

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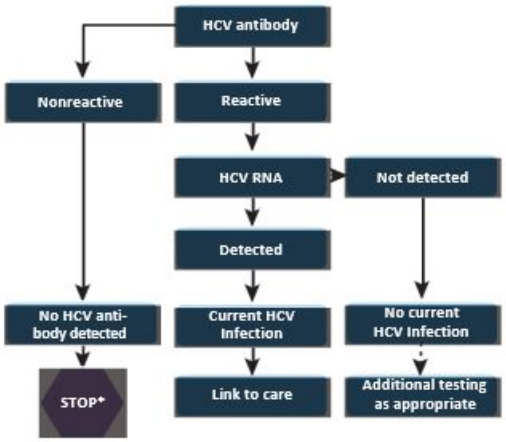

There were several limitations in our study. First, our data were from the surveillance data for HCV infection, patients were more likely to be sick with HCV infection. As a result, a number of infected cases might be higher within this cohort of patients, leading to a higher prevalence in our sample. To increase our validity, the prevalence per 100,000 population was calculated. Second, a small sample size for acute HCV made it difficult to determine the patient characteristics, particularly for acute HCV infection. Third, data on risk behaviors toward HCV infection were not collected through our surveillance system, it is hard to identify specific high risk population groups in Delaware. Although, extrapolating from national data, it is believed that high risk populations in Delaware (e.g., people living with HIV, persons who inject drugs, "baby-boomers," et al) contribute a large portion of HCV infected cases. Percutaneous exposure to contaminated blood is the most efficient mode of transmission for HCV. Recent reports from Delaware indicated that there were at least 3,500 people living with HIV in Delaware in 2015, and around 2,750 people in Delaware sought for heroin treatment in 2013.[4,5] Injecting drug use is a risk factor for both HIV and HCV infection. Thus, integrated health care services are needed to treat substance abuse and blood borne infections deriving from illicit drug use and high risk behaviors.

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