Retrospective Surveillance of Perinatal Hepatitis C Virus Exposure – Tennessee, 2013-2017

Heather E. Wingate, Lindsey Sizemore, Jennifer Black, Zachary Heth, Carolyn Wester

Tennessee Department of Health, Nashville, Tennessee, United States

Objective

1. To quantify the burden of perinatal hepatitis C (HCV) exposure and examine the geographic variation in Tennessee (TN).
2. Develop new surveillance strategies for retrospective tracking of perinatal HCV exposures.

Introduction

Hepatitis C virus (HCV) infections are increasing nationwide and are of particular concern in Tennessee, especially among individuals of reproductive age [1,2]. Maternal HCV status reported on the birth certificate reveals that the rate of HCV among women giving birth in TN increased 163% from 2009-2014 [3]. Further, a 2017 TN Department of Health (TDH) study found that 30% of reproductive aged women with newly reported chronic HCV in TN were determined to be pregnant. While current treatment options are not recommended for children under 12, it is critical to identify an infant's HCV status in order for him/her to receive proper care. Given the high rates of pregnancy reported among women with newly diagnosed HCV, we sought to expand viral hepatitis surveillance efforts to quantify the extent of the burden of HCV among women giving birth in TN, utilizing surveillance data in lieu of standalone birth certificate data.

Methods

Birth certificate data, denoting all live births in TN from 2013 to 2017, were obtained from the TDH Birth Statistical File (n=404,694). Maternal HCV infection laboratory data were obtained from the TDH National Electronic Surveillance System (NEDSS) Based System (NBS). Maternal birth certificate and maternal HCV data were matched using a step-wise matching algorithm; records were required to match on one of the following criteria: (1) first name, last name, and date of birth (DOB); (2) first name, maiden name, and DOB; (3) phonetic first name, phonetic last name, DOB; (4) phonetic first name, phonetic maiden name, and DOB; or (5) social security number.

For geographical variations, maternal county of residence was extracted from birth certificate data. As there is currently no case definition pertaining to HCV- positive pregnant women, laboratory data was used to determine perinatal exposure case status for each live birth as follows: (1) *confirmed exposure*, if a mother had at least 1 HCV RNA-positive lab during pregnancy, or in the absence of a pregnancy lab, at least one HCV RNA was conducted prior to pregnancy and the last HCV RNA prior to pregnancy was positive; (2) *probable exposure*, if a mother did not have an HCV RNA test, but had an HCV Ab-positive lab preceding or during pregnancy; or (3) *no exposure*, if a mother had a history of HCV, but only HCV RNA-negative labs during pregnancy, or in the absence of a pregnancy lab, at least one HCV RNA was conducted prior to pregnancy and the last RNA prior to pregnancy was negative. HCV infant exposure rates were calculated using the number of probable or confirmed HCV perinatal exposures divided by the total number of live births*1,000.

Results

From 2013 to 2017, there were 4,909 perinatal HCV exposures, with an average exposure rate of 12.1 per 1,000 live births. The exposure rate increased by 93.7%, from 7.9 in 2013 to 15.3 in 2017 (**Table 1**). Using an estimated 5.8% transmission rate, 285 infants acquired HCV infection perinatally over the past 5 years in TN [4].

Figure 1 depicts the rates of perinatal exposure per 1,000 live births in 2017, by county, and illustrates the large geographical variability of the perinatal HCV exposure rates. While the statewide average was 1.5%, this varied from 0% to 14.1% across TN. Eastern TN counties had higher rates; some signifying 5% to 14.1% of all infants born were vertically exposed to HCV.

Limitations of our study included incomplete chronic HCV surveillance data, reporting bias, and external validity. Chronic HCV surveillance in TN was not routine until July 2015, and chronic HCV was not reportable until January 1, 2017. With respect to data included in our study prior to July 2015, only electronic laboratory reports were used, which could have resulted in under-reporting. Additionally, as pregnancy is not currently reportable in the context of HCV, we relied solely on birth certificate and NBS record

matching to identify exposure. Lastly, our findings may not be generalizable to the rest of the US, as we only studied women of reproductive age in TN.

Strengths to our study included the utilization of two reliable data sources, NBS and Birth Certificate data to determine perinatal HCV exposure. Analyzing data over a 5-year period allowed for a large sample size. Additionally, unlike previous studies, we analyzed laboratory data versus birth certificate data which is physician-reported and has been shown to underestimate the prevalence of maternal HCV infection [5].

Conclusions

High numbers of reported HCV cases among reproductive aged women translates into high rates of perinatal exposure to HCV among live born infants. As compared to maternal HCV status reported on birth certificates, matching birth records with HCV surveillance databases provides advantages to perinatal surveillance by: 1) detecting more cases, and 2) providing the ability to tease out current versus prior infection in mother and, therefore, actual exposure. This type of maternal surveillance provides unique opportunities to reach out and ensure that HCV infected mothers receive important information regarding appropriate infant testing, as indicated by the 2018 case definition, as well as disease prevention [6]. Beginning in 2018, TDH has started to conduct surveillance on HCV exposed infants using these methods to track potential transmission in real-time, allowing us to evaluate testing outcomes among these exposed infants and determine if the infants are in appropriate care.

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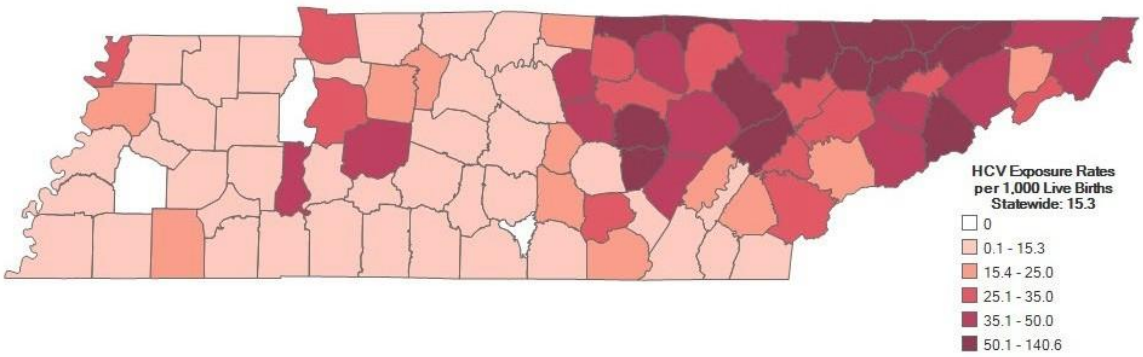

Figure 1. Rates of Perinatal HCV Exposure per 1,000 Live Births in TN, 2017

Table 1. HCV Perinatal Exposure per Live Birth in TN: 2013 to 2017

Year	Probable Exposure	Confirmed Exposure	No Exposure	Total Exposed*	Total Live Births	HCV Exposed per 1,000 Live Births
2013	304	327	38	631	79,954	7.9
2014	311	501	38	812	81,609	9.9
2015	350	631	87	981	81,374	12.1
2016	477	770	162	1,247	80,755	15.4
2017	430	808	191	1,238	81,002	15.3
Total	1,872	3,037	516	4,909	404,694	12.1

*Total exposed was calculated using the sum of probable and confirmed exposures.