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Inequities in Hepatitis Virus Testing for Perinatally Exposed Infants in Tennessee: 2018 to 2023

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Abstract

Approximately 6% to 7% of infants born to pregnant persons with hepatitis C virus (HCV) monoinfections acquire HCV infections.^{1,2} Although guidelines recommend testing infants who are perinatally exposed to HCV,^{3,4} only ~1 in 4 are tested.^{5,6} Curative HCV treatment is available for children aged ≥ 3 years.³ To guide HCV mitigation efforts in Tennessee, we examined the sociodemographic factors associated with HCV testing and infection among infants.

METHODS

The Tennessee Department of Health (TDH) identifies infants who have been perinatally exposed to HCV by linking HCV test results to birth certificates. All antibody-positive, RNA-positive, and RNA-negative HCV test results are reportable in Tennessee. Although antibody-negative HCV test results are not reportable, the TDH requests that the infant's clinician provide these results if antibody testing is performed. For infants born to pregnant persons with hepatitis C from January 1, 2018 to July 31, 2020, we collected select sociodemographic information (eg, race, ethnicity, county, and insurance type) from birth certificate information and linked it with infant HCV test results as of July 31, 2023.

We defined HCV RNA testing at 2 to 36 months of age or antibody testing at 18 to 36 months of age as guideline-adherent to include guideline changes during the study

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period;^{3,4} testing conducted outside these ages was defined as not guideline-adherent. The TDH defines perinatal hepatitis C cases as confirmed if RNA is detected at 2 to 36 months of age, probable if the patient is antibody-reactive from 18 to 36 months of age, and excluded if the patient is RNA-negative at 2 to 36 months of age or antibody-negative before 36 months of age. Counties of residence were categorized as large metropolitan, small or medium metropolitan, and nonmetropolitan.⁷ Sociodemographic factors associated with guideline-adherent testing and case status were descriptively analyzed by using SAS version 9.4 (SAS Institute, Cary, NC) and a 1-sample proportions test was conducted to estimate the undiagnosed perinatal HCV infection number. This activity was reviewed and approved by the TDH Institutional Review Board and the Centers for Disease Control and Prevention.

RESULTS

Among 3020 infants perinatally exposed to HCV, 776 (26%) had guideline-adherent HCV testing, 177 (6%) had testing that was not guideline-adherent, and 2067 (68%) did not have testing reported to the TDH. The proportion of infants with guideline-adherent testing increased during the study period. Infants born to Black or Hispanic persons had lower odds of receiving guideline-adherent testing, compared with white (odds ratio [OR] = 0.33 [95% confidence interval (CI): 0.20–0.53]) or non-Hispanic (OR = 0.27 [95% CI: 0.11–0.68]) persons. Infants had higher odds of receiving guideline-adherent testing if they were born to a person residing in a metropolitan county categorized as small or medium, compared with large (OR = 2.94 [95% CI: 2.32–3.72]), or if public insurance was used at birth, compared with private insurance (OR = 1.64 [95% CI: 1.23–2.18]) (Table 1).

Perinatal hepatitis C case status was determined for 776 infants with guideline-adherent testing and 22 infants with negative antibody test results before 18 months of age. Of 798 infants, 159 (20%) had the earliest results from HCV RNA testing at a median age of 14 months (interquartile range = 6–20 months). The remaining 639 infants (80%) had antibody testing initially at a median age of 20 months (interquartile range = 19–25 months). Among these 798 infants, 51 (6.4% [95% CI: 4.9–8.3]) were classified as having confirmed ($n = 45$) or probable ($n = 6$) perinatal hepatitis C. Among these infants, the odds of HCV infection were not statistically different by assessed sociodemographic factors (Table 2). Using a 6% transmission rate, we would expect 181 (95% CI: 157–208) perinatal HCV infections among our total population; therefore, ~130 infants remain undiagnosed.

DISCUSSION

Despite recommendations that every infant perinatally exposed to HCV be tested, only 26% were tested according to guidelines in Tennessee, although underestimation might have occurred because of voluntary reporting for negative antibody test results. The authors of previous reports have identified similar frequencies of testing.^{5,6} Black and Hispanic infants were less frequently tested and, therefore, likely over-represented among infants with undiagnosed HCV infections. With curative HCV treatment recommended for children as young as 3 years,³ children with undiagnosed infections might be less likely to receive timely curative treatment and be disproportionately affected by HCV complications.

In addition to the TDH, Eastern Tennessee health departments and the TennCare public insurance program increased clinician outreach during this study period, which might explain why small and medium metropolitan counties and public insurance were associated with increased testing. Recent guidelines emphasizing RNA testing at 2 to 6 months of age might increase testing by facilitating testing when infants frequently access health care (eg, well-child visits).^{4,8} Systemic processes to improve testing are also needed, such as electronic medical record prompts. Equitable implementation of these measures is necessary to avoid compounding racial and ethnic disparities in pediatric HCV diagnosis and treatment.

ABBREVIATIONS

CI	confidence interval
HCV	hepatitis C virus
OR	odds ratio
TDH	Tennessee Department of Health

REFERENCES

1. Ades AE, Gordon F, Scott K, et al. Overall vertical transmission of hepatitis C virus, transmission net of clearance, and timing of transmission. *Clin Infect Dis*. 2023;76(5):905–912 [PubMed: 35403676]
2. Benova L, Mohamoud YA, Calvert C, Abu-Raddad LJ. Vertical transmission of hepatitis C virus: systematic review and meta-analysis. *Clin Infect Dis*. 2014;59(6):765–773 [PubMed: 24928290]
3. AASLD-IDSA HCV Guidance Panel. Hepatitis C guidance 2018 update: AASLD-IDSA recommendations for testing, managing, and treating hepatitis C virus infection. *Clin Infect Dis*. 2018;67(10): 1477–1492 [PubMed: 30215672]
4. Panagiotakopoulos L, Sandul AL, Connors EE, et al. ; Collaborators. CDC recommendations for hepatitis C testing among perinatally exposed infants and children—United States, 2023. *MMWR Recomm Rep*. 2023;72(4):1–21
5. Lopata SM, McNeer E, Dudley JA, et al. Hepatitis C testing among perinatally exposed infants. *Pediatrics*. 2020;145(3):e20192482 [PubMed: 32060140]
6. Bhardwaj AM, Mhanna MJ, Abughali NF. Maternal risk factors associated with inadequate testing and loss to follow-up in infants with perinatal hepatitis C virus exposure. *J Neonatal Perinatal Med*. 2021;14(1):123–129 [PubMed: 32039866]
7. Centers for Disease Control and Prevention. National Center for Health Statistics - urban rural classification scheme for counties. Available at: https://www.cdc.gov/nchs/data_access/urban_rural.htm. Accessed March 6, 2024
8. Saleh E, Jhaveri R. Earlier testing of infants with perinatal hepatitis C exposure: a key step toward elimination. *Pediatrics*. 2023;153(1):e2023064242

Comparison of Testing Practices for Infants Perinatally Exposed to HCV by Sociodemographic Characteristics: Tennessee, January 2018–July 2020^a

TABLE 1

Characteristic	No Reported Testing		Guideline-Adherent Testing ^b		Testing Not Guideline-Adherent ^b	
	No. (%)		No. (%)	OR (95% CI) ^c	No. (%)	OR (95% CI) ^c
Total	2067		776		177	
Year of birth						
2018	932 (45)		253 (33)	(ref)	112 (63)	(ref)
2019	722 (35)		325 (42)	1.66 (1.37–2.01) ^d	47 (27)	0.54 (0.38–0.77) ^d
2020	413 (20)		198 (26)	1.77 (1.42–2.20) ^d	18 (10)	0.36 (0.22–0.60) ^d
Child sex						
Male	1103 (53)		385 (50)	(ref)	88 (50)	(ref)
Female	964 (47)		391 (50)	1.16 (0.99–1.37)	89 (50)	1.16 (0.85–1.57)
Pregnant person's age, median (IQR)	29 (25–32)		28 (26–32)		28 (25–32)	
Pregnant person's race						
White	1877 (91)		750 (97)	(ref)	166 (94)	(ref)
Black	153 (7)		20 (3)	0.33 (0.20–0.53) ^d	9 (5)	0.67 (0.33–1.33)
Asian	13 (1)		2 (<1)	0.39 (0.09–1.71)	0	0.87 (0.04–5.01)
American Indian or Alaska Native	5 (<1)		0	0.50 (0.02–3.63)	1 (<1)	2.26 (0.26–19.47)
Other	14 (1)		3 (<1)	0.54 (0.15–1.87)	1 (<1)	0.81 (0.11–6.18)
Pregnant person's ethnicity						
Non-Hispanic	1996 (97)		768 (99)	(ref)	177 (97)	(ref)
Hispanic	48 (2)		5 (1)	0.27 (0.11–0.68) ^d	4 (2)	0.97 (0.35–2.73)
Pregnant person's residence						
Large central and fringe metropolitan	524 (25)		108 (14)	(ref)	45 (25)	(ref)
Small and medium metropolitan	795 (38)		481 (62)	2.94 (2.32–3.72) ^d	80 (45)	1.17 (0.80–1.72)
Nonmetropolitan	748 (36)		186 (24)	1.21 (0.93–1.57)	52 (29)	0.81 (0.53–1.23)
Insurance type at delivery						
Private	263 (13)		65 (8)	(ref)	12 (7)	(ref)

Characteristic	No Reported Testing		Guideline-Adherent Testing ^b		Testing Not Guideline-Adherent ^b	
	No. (%)		No. (%)	OR (95% CI) ^c	No. (%)	OR (95% CI) ^c
Public and government	1685 (82)		683 (88)	1.64 (1.23–2.18) ^d	153 (86)	1.99 (1.09–3.63) ^d
Self-pay, other, and unknown	119 (6)		28 (4)	0.95 (0.58–1.56)	12 (7)	2.21 (0.96–5.06)

^a Difference in frequencies is from missing data.

^b Guideline-adherent testing was defined as HCV RNA testing at 2 to 36 mo or antibody testing at 18 to 36 mo of age; testing conducted outside these ages was defined as not guideline-adherent.

^c For ORs and 95% CIs, infants with no reported testing were used as the comparison group.

^d Statistically significant.

Comparison of HCV Status Among Infants Tested for Perinatally Acquired HCV by Sociodemographic Characteristics: Tennessee, January 2018–July 2020^a

TABLE 2

Characteristic	Confirmed ^b or Probable ^c Perinatal Hepatitis C Cases, n = 51	Uninfected Perinatally Exposed, n = 747	ORs (95% CI)
Year of birth			
2018	11 (22%)	251 (34%)	(ref)
2019	23 (45%)	311 (42%)	1.69 (0.81–3.53)
2020	17 (33%)	185 (25%)	2.10 (0.96–4.58)
Sex			
Male	24 (47%)	376 (50%)	(ref)
Female	27 (53%)	371 (50%)	1.14 (0.65–2.01)
Pregnant person's age, median (IQR)	28 (25–32)	28 (26–32)	
Pregnant person's race			
White	49 (96%)	722 (97%)	(ref)
Black	0	21 (3%)	0.70 (0.03–3.93)
Asian	1 (2%)	1 (<1%)	14.73 (0.91–239.15)
Other	1 (2%)	2 (<1%)	7.36 (0.66–82.67)
Pregnant person's ethnicity			
Non-Hispanic	50 (98%)	738 (99%)	(ref)
Hispanic	1 (2%)	6 (1%)	2.46 (0.29–20.83)
Pregnant person's residence			
Large central and fringe metropolitan	9 (18%)	102 (14%)	(ref)
Small and medium metropolitan	32 (63%)	461 (62%)	0.79 (0.36–1.70)
Nonmetropolitan	10 (20%)	183 (25%)	0.62 (0.24–1.57)
Insurance type at delivery			
Private	2 (4%)	63 (8%)	(ref)
Public and government	45 (88%)	659 (88%)	2.15 (0.51–9.08)
Self-pay and other and unknown	4 (8%)	25 (3%)	5.04 (0.87–29.28)

^a Percentages might not add up to 100% because of missing data.

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Perinatal hepatitis C cases were defined as confirmed if HCV RNA was detected at 2 to 36 mo of age.
Perinatal hepatitis C cases were defined as probable if HCV antibody was reactive at 18 to 36 mo of age.