

## Risk-Based Hepatitis C Screening in Pregnancy Is Less Reliable Than Universal Screening: A Retrospective Chart Review

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Current guidelines recommend only hepatitis C virus (HCV) risk-based screening during pregnancy. We examined screening practices at a major medical center and found inconsistent risk-based screening and the presence of HCV among women with no known risk factors. We make a case for the implementation of universal HCV screening during pregnancy.

**Keywords.** hepatitis C virus; pregnancy; risk factors; universal screening.

Hepatitis C virus (HCV) is a major cause of morbidity and mortality, causing liver cirrhosis, hepatocellular carcinoma, and death [1]. The global prevalence of HCV is estimated to be 1.0% (95% confidence intervals [CI] 0.8%–1.1%) in 2015, corresponding to 71.1 million (62.5–79.4 million) infections [2]. In the United States, approximately 3.5 million individuals are infected, and this number is likely to climb given the current opioid epidemic [3]. In the United States, 1%–2.5% of pregnant women are infected with HCV with a 6% risk of vertical transmission [3, 4]. HCV during pregnancy is associated with fetal growth restriction, low birthweight, vertical transmission, and gestational hypertension [5]. Current national guidelines recommend only risk-based screening during pregnancy and subsequent screening of children born to HCV-infected mothers [6, 7]. Risk factors include intravenous drug use (IVDU), transplant or blood transfusions before 1992, long-term hemodialysis, tattoos and piercings, and receipt of clotting factors or IgG before 1987 [8]. However, many women are unaware of

their HCV status and may withhold information about HCV risk factors. Previous work by our group in Egypt showed that risk-based screening missed 10% of chronically infected pregnant women [9]. Our study was conducted at the University of Maryland Medical Center (UMMC) in Baltimore, a city where 26 000 to 40 000 individuals are infected with HCV [10]. We aimed to determine the proportion of women tested for HCV during pregnancy, the prevalence of HCV among women being tested, and the association between testing and risk factors for HCV during pregnancy.

### METHODS

This study is a retrospective secondary data analysis using electronic medical records (EMRs) of pregnant women presenting to UMMC for antenatal care from January 1 to December 31, 2016. A list of women presenting for antenatal care was generated by a Current Procedural Terminology code query, and their EMR records were examined. Visits reviewed included their first antenatal visit until termination of pregnancy, delivery, cessation of care at UMMC, or December 31, 2016, whichever came first. Records from outside hospitals and outpatient clinics were not reviewed. Some women had more than 1 pregnancy that began or ended in 2016. Each pregnancy was considered individually in analysis.

Data were collected from the problem list and medical notes on the number of antenatal visits at UMMC, history of IVDU, transplant, or blood transfusions before 1992, long-term hemodialysis, tattoos, piercings, and receipt of clotting factors or IgG before 1987, and whether each mother was tested for HCV. Our definition of HCV testing was any testing for anti-HCV antibodies and qualitative or quantitative HCV RNA. Among women tested for HCV, additional information was gathered on their HCV status, whether they were diagnosed during this pregnancy, and whether they previously had a diagnosed HCV infection.

Means, standard deviations, and proportions were calculated using Microsoft Excel 2013. Associations between HCV testing and risk factors were calculated using 2-tailed Fisher exact tests.

The University of Maryland, Baltimore, Institutional Review Board formally reviewed this study and determined the analysis of this de-identified data set to be exempt.

### RESULTS

Medical records from 1426 pregnancies were reviewed. On average women had 6.6 (SD, 4.8) prenatal visits at UMMC. Of the 1426 pregnancies, 100 (7.0%) were tested for HCV. None of the women had received clotting factors or IgG before 1987, or had a transplant or blood transfusion prior to 1992. Forty

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pregnancies occurred in women with a history of IVDU, 35 occurred in women with HIV, 6 occurred in women with tattoos or piercings, and 1 occurred in a woman with long-term hemodialysis (Table 1).

Among 78 pregnancies in women with any risk factor, the majority (50/78, 64.1%) were not tested. Of these 50 women, 17 had a history of IVDU, 22 were HIV+, 5 had tattoos, 1 was on long-term hemodialysis, 1 had previously had a positive HCV test, and 4 had multiple risk factors. The association between having a risk factor and being tested (Table 1) was statistically significant for pregnancies in women with IVDU or with HIV or any risk factor. There was no statistically significant association between having a tattoo/piercing or being on long-term hemodialysis and being tested.

Of the 100 pregnancies in which women were tested for HCV, 10 (10%) were positive (0.7% of the 1426 pregnancies). Eight were women with histories of IVDU (1 was also HIV+). One pregnancy was in a woman who had a tattoo/piercing, and 1 pregnancy (10%) was from a woman with no known risk factors for HCV. Five (50%) of these cases were newly diagnosed during this pregnancy. Among these women, 4 were HIV+ and 1 had no known risk factors. Three women previously known to be HCV positive were not tested this pregnancy (women with a history of HCV were retested for viral load).

## DISCUSSION

We found that 7% of pregnant women receiving prenatal care at UMMC were tested for HCV and 5% had risk factors for HCV. However, among women with known HCV risk factors, nearly two-thirds were not screened for HCV. We found that 10% of HCV+ pregnancies occurred in women with no reported risk factor. However, the presence of tattoos or piercings was rarely recorded in the EMR unless the tattoos were extensive, or if piercings could interfere with breastfeeding or vaginal delivery. History of IVDU is likely higher than identified. Women may not divulge prior IVDU due to fear of legal retribution or discrimination from health care providers. For these reasons, we believe that the actual number of women with risk factors was likely higher than reported here. This finding of targeted screening being ineffective is not surprising. Limited efficacy

of risk-based screening in baby boomers has led the Centers for Disease Control and Prevention to recommend universal screening in those born between 1945 and 1965 [8].

We argue that universal HCV screening should be introduced during pregnancy. Knowledge of HCV status changes how obstetricians manage patients in order to reduce the risk of vertical transmission (eg, avoiding invasive testing and use of fetal scalp electrodes). Universal screening is logistically feasible and can identify new cases of HCV at a time when women regularly encounter the health care system and can be referred for treatment. This approach has been successful for prevention of mother-to-child transmission of HIV. HIV screening in pregnancy is universal even though HIV-positive mothers account for only 8500 (0.02%) of births per year in the United States [11]. In our sample, 0.7% of the women were HCV-positive, which is likely an underestimation as only 7% were tested. Additionally, HIV treatment is lifelong whereas HCV treatment is a 1-time 12-week curative course that will prevent the woman from transmitting infection to her future children or other adults. Universal HCV screening with repeat screening in the third trimester for high-risk women, as done for HIV, should be implemented.

There has been resistance to HCV screening during pregnancy because of the significant side effects of past treatment with pegylated interferon alpha and ribavirin, and the teratogenic effects of ribavirin. However, new highly effective direct acting antiviral agents are curative, have far fewer side effects, and may be approved for use in pregnancy once clinical trials ([www.clinicaltrials.gov](http://www.clinicaltrials.gov) #NCT02683005) are completed. Until then, they can be used to treat postpartum women after they have completed breast-feeding.

We were surprised by the number of women screened for HCV with no recorded risk factors. It is possible that busy clinicians did not document risk factors they identified, were not clear about current screening guidelines, or had a high suspicion for HCV despite patient denial of risk factors. It is also likely that some women were tested as part of a hepatitis panel that is often ordered following unexplained elevated liver function tests. Also, despite national guidelines, many clinicians included HCV when patients requested STD screening.

**Table 1. Frequency of HCV Risk Factors Based on Whether or Not Women Were Tested for HCV**

Risk Factor	Tested for HCV (n = 100), No. (%)	Not Tested for HCV (n = 1326), No. (%)	P Value
Intravenous drug use	19 (19)	21 (1.6)	<.0001
HIV positive	10 (10)	25 (1.9)	<.0001
Tattoos or piercings	1 (1)	5 (0.4)	.354
Clotting factors or IgG before 1987	0 (0)	0 (0)	1.000
Organ transplant or blood transfusion before 1992	0 (0)	0 (0)	1.000
Long-term hemodialysis	0 (0)	1 (<0.1)	1.000
Any risk factor <sup>a</sup>	28 (28)	50 (3.8)	<.0001

Abbreviation: HCV, hepatitis C virus.

<sup>a</sup>Total not equal to sum of individual risk factors due to multiple risk factors in some women.

Future studies of physician attitudes toward HCV screening may elucidate this.

Our study has several limitations. As this is a retrospective analysis of EMRs, there may be missing data due to insufficient documentation of HCV test results or risk factors; or HCV screening conducted at another center. Our data are from 1 center and may not represent findings at other hospitals or the nation at large, although similar results were found in a prospective study in Cleveland [12]. Finally, we were unable to follow children born to these women and cannot comment on vertical transmission. While future studies would benefit from a multicenter prospective design with standardized protocols for determining HCV risk factors at first antenatal visit and long-term follow-up of mother-infant pairs, we do not believe that this should delay potentially life-saving policy changes.

HCV is a promising target for eradication; it is curable, only transmitted by humans, and has a low infection rate [12]. The largest obstacle is identifying cases—individuals are often unaware of their status and have infrequent contact with the health care system. Universal screening is already being rolled out in baby boomers. Expanding universal screening to pregnancy could be an important tool in HCV control and ultimately eradication.

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