HHS Public Access

Author manuscript

*Am J Obstet Gynecol*. Author manuscript; available in PMC 2016 April 01.

Published in final edited form as:

*Am J Obstet Gynecol*. 2015 April ; 212(4): 524.e1–524.e7. doi:10.1016/j.ajog.2014.10.1093.

# Recent trends in hepatic diseases during pregnancy in the United States, 2002–2010

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## Abstract

**OBJECTIVE—**While pregnancy-related severe liver disorders are rare, when they occur morbidity and mortality rates are increased for mothers and infants. The objective of this study was to examine the prevalence and trends of hepatic diseases during pregnancy hospitalizations from 2002 through 2010 in the United States.

**STUDY DESIGN—**Hospital discharge data were obtained from the Nationwide Inpatient Sample, the largest all-payer hospital inpatient care database in the United States that provides nationally representative estimates. Pregnancy hospitalizations with the following diagnoses were identified: hepatitis B, hepatitis C, gallbladder disease/cholelithiasis, liver disorders of pregnancy, chronic/alcohol-related liver disease, biliary tract disease, and HELLP (hemolysis, elevated liver enzymes, low platelet count) syndrome. Age, insurance status, hospital location, and hospital region were compared among women with and without hepatic diseases using a $\chi^2$ test. Trends in rates of pregnancy hospitalizations and mean charges were analyzed using multivariable logistic and linear regression, respectively.

**RESULTS—**From 2002 through 2010 there were an estimated 41,479,358 pregnancy hospitalizations in the United States. Gallbladder disease and liver disorders of pregnancy were the most common hepatic diseases (rates = 7.18 and 4.65/1000 pregnancy hospitalizations, respectively). Adjusted rates and mean charges significantly increased for all hepatic diseases during pregnancy over the study period. All hepatic diseases were associated with significantly higher charges compared to all pregnancy hospitalizations. HELLP syndrome was associated with the highest mean charges.

**CONCLUSION—**This large study among a representative sample of the US population provides valuable information that can aid policy planning and management of these hepatic diseases during pregnancy in the United States.



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The authors report no conflict of interest.

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

**Keywords**

hepatic disease; hepatitis; liver disease; pregnancy

During pregnancy women may experience physiologic changes in their liver biochemical profile; however, pregnancy-related severe liver diseases are uncommon. When these complications occur, the morbidity and mortality rates are increased for the mother and fetus.[1-4] Some liver diseases are unique to pregnancy, including acute fatty liver of pregnancy (AFLP), HELLP (hemolysis, elevated liver enzymes, low platelet count) syndrome, and intrahepatic cholestasis of pregnancy (ICP), all of which primarily occur in the third trimester. As previously documented, AFLP has affected between 1 in 7000 and 1 in 20,000 pregnancies, and the maternal and fetal mortality rate is high.[1,2,5] HELLP syndrome affects 0.5-0.9% of all pregnancies and 10-20% of severe preeclampsia cases[6] and is associated with outcomes such as disseminated intravascular coagulopathy, placental abruption, acute renal failure, pulmonary edema, and cardiopulmonary arrest.[5] Additionally, HELLP syndrome is associated with a fetal mortality of 7-20%.[5] ICP affects approximately 0.5-1% of pregnancies in the United States. Maternal complications from ICP are very rare, but fetal complications including prematurity, respiratory distress syndrome, and death can occur.[1,5]

In addition to liver diseases unique to pregnancy, other hepatic diseases such as viral hepatitis, biliary tract disease, and gallbladder disease create complications for mother and fetus during pregnancy. Approximately 1 million people are chronically infected with hepatitis B virus (HBV) in the United States.[7] In 2005, approximately 24,000 chronically HBV-infected women gave birth in the United States.[8] Hepatitis C virus (HCV) infection is the most common chronic blood-borne infection in the United States with approximately 3.9 million people chronically infected.[9,10] Among women of reproductive age in the United States, the prevalence of HCV infection is approximately 1%, with an estimated 40,000 deliveries among HCV-infected women each year.[11]

Historically, the incidence of gallbladder and other biliary tract diseases during pregnancy has ranged from 0.05–0.3%.[12-16] However, current estimates of incidence are lacking.[1] Among pregnant women, gallbladder disease is the second most common non-obstetrical indication for surgical intervention, as 5-12% of pregnant women have gall stones and the risk increases with gravidity.[14]

Cirrhosis is rare among pregnant women due in part to the low prevalence of cirrhosis in women of reproductive age (0.0004%). Additionally, most women with advanced cirrhosis have amenorrhea and anovulation.[2,17,18] However, for women with cirrhosis who do become pregnant, the risk of maternal and fetal complications has been reported in up to 50% of cases and maternal mortality has been reported in up to 10% of cases.[2,19,20]

There is little information about the prevalence of and trends in hepatic diseases in pregnancy in the United States. The Healthcare Cost and Utilization Project's (HCUP) Nationwide Inpatient Sample (NIS) database provides a nationally representative sample of

US hospitalizations. The objective of this study was to examine the prevalence and trends of select hepatic diseases during pregnancy hospitalizations over 9 years in the United States.

## Materials and Methods

We obtained hospital discharge data without identifiers from the HCUP NIS. The NIS, one of a family of research databases and software tools sponsored by the Agency for Healthcare Research and Quality in partnership with state-level data-collection organizations, provides research databases of national and regional inpatient care delivered in the United States.[21]

The NIS is a stratified probability sample of approximately 20% of all US community hospitals as defined by the American Hospital Association (AHA). Hospitals are selected for the NIS on the basis of 5 characteristics: geographic region, ownership, rural/urban location, teaching status, and bed size. The NIS includes all inpatient stays from an average of roughly 1000 hospitals; when weighted, the NIS data on 7 million discharges provide national estimates of inpatient care.[22] It is the largest collection of inpatient care data in the United States and includes patient demographic data and diagnostic/procedural data, as well as facility information.

We analyzed NIS data for a 9-year period from 2002 through 2010, a period during which several revisions were made to the NIS design. The number of states in the NIS has increased from 35 in 2002 to 45 in 2010. This expanded the number of sampled hospitals from 995 in 2002 to 1051 in 2010. By 2010, these states included >96% of the US population. Beginning in 2004, NIS changed the classification of urban or rural hospital location for the sampling strata to use the newer Core Based Statistical Area codes, rather than the older Metropolitan Statistical Area codes. The Core Based Statistical Area groups are based on 2000 Census data, whereas the Metropolitan Statistical Area groups were based on 1990 Census data. Also, the criteria for classifying the counties differ.[23] Before 2005, the AHA defined community hospitals as nonfederal, short-term (average length of stay <30 days) general and specialty hospitals whose facilities are open to the public. Starting in 2005, the AHA also included long-term acute-care facilities (stays of >25 days) in the definition of community hospitals, therefore such facilities are included in the NIS sampling frame.[22]

Our analysis was restricted to pregnant girls and women 15 years of age and older. We attempted to identify all pregnancy hospitalizations (excluding those for ectopic/molar pregnancy or spontaneous abortion) by searching for those with a primary or secondary *International Classification of Diseases, Ninth Revision, Clinical Modification* (*ICD-9-CM*) discharge code of 640-677, V22-V24, V27-V28, or 792.3. Pregnancy hospitalizations that resulted in a delivery were identified by *ICD-9-CM* codes 650 and V27, in addition to procedure codes of 720, 721, 722.1, 722.9, 723.1, 723.9, 724, 725.1-725.4, 726, 727.1, 727.9, 728, 729, 732.2, 735.9, 736, 740-742, 744, and 749.9, and diagnosisrelated group codes of 370-375.

We examined all data in the following 3-year intervals: 2002 through 2004, 2005 through 2007, and 2008 through 2010. We compared age distribution, insurance status, hospital

location, and hospital region for pregnant women with and without the following hepatic diseases: hepatitis B, hepatitis C, gallbladder disease/cholelithiasis, liver disorders of pregnancy, chronic and alcohol-related liver disease, biliary tract disease, and HELLP syndrome, using a $\chi^2$ test with a significance level of 0.0018 that adjusts for multiple corrections using a Bonferroni correction. Up to 25 diagnoses were examined for each pregnancy hospitalization. We used *ICD-9-CM* codes to identify pregnancy hospitalizations with these morbidities: (i) for HBV infection, *ICD-9-CM* codes 070.2, 070.3, 070.42, 070.52; (ii) for HCV infection, *ICD-9-CM* codes 070.41, 070.44, 070.51, 070.54, 070.7; (iii) for other viral hepatitis including hepatitis A, hepatitis E, and unspecified viral hepatitis, *ICD-9-CM* codes 070.0, 070.1, 070.43, 070.49, 070.53, 070.59, 070.6, 070.9, 573.1, 573.2; (iv) for gallbladder disease/cholelithiasis, *ICD-9-CM* codes 574, 575; (v) for liver disorders of pregnancy including AFLP, ICP, icterus gravis pregnancy, necrosis of liver of pregnancy, and hepatorenal syndrome following delivery, *ICD-9-CM* codes 646.7, 674.8; (vi) for chronic and alcohol-related liver disease including cirrhosis, *ICD-9-CM* codes 571, 572; (vii) for other biliary tract diseases including cholangitis and obstruction, perforation, and fistula of the bile duct, *ICD-9-CM* code 576; and (viii) for hepatobiliary malignancies, *ICD-9-CM* codes 155.0, 155.1, 155.2, 156.0, 156.1, 156.2, 156.8, 156.9. There is no *ICD-9-CM* code specifically for HELLP syndrome; rather it is typically coded as severe preeclampsia. We defined HELLP syndrome as severe preeclampsia (*ICD-9-CM* 642.5) with presence of at least one of the following: other disorders of the liver (*ICD-9-CM* codes 570, 573.0, 573.3, 573.4, 573.8, 573.9), liver disorders of pregnancy (*ICD-9-CM* codes 646.7, 674.8), or thrombocytopenia (*ICD-9-CM* codes 287.3, 287.4, 287.5).

Age was categorized as follows: 15-24 years, 25-34 years, and ≥35 years. Insurance status was dichotomized into private insurance and public/self–pay. Hospital location and hospital region were used as categorized in the NIS (location: rural, urban; region: Northeast, Midwest, South, West).

Trends in rates of pregnancy hospitalizations with a coded hepatic disease per 1000 deliveries over time were compared using multivariable logistic regression models adjusted for age, insurance status, and delivery status, with 2002 through 2004 as the referent period. Additionally, to assess trends in mean hospital charges for pregnant women with hepatic diseases during pregnancy, we used linear regression adjusting for age, insurance status, and delivery status. Hospital charges were adjusted to account for inflation using the Bureau of Labor Statistics' Consumer Price Index. Hospitalization-to-delivery ratios were calculated to assess disease burden during pregnancy. All statistical analyses were conducted with SAS callable SUDAAN, version 9.3 (Research Triangle Institute, NC).

The study was determined to be exempt from human subjects review as an analysis of preexisting deidentified data.

## Results

From 2002 through 2010 there were an estimated 41,479,358 pregnancy hospitalizations including an estimated 37,465,214 deliveries available for the analysis. Table 1 shows the

crude rate in 3-year periods of hospitalizations in which a hepatic disease was coded per 1000 pregnancy hospitalizations.

During the 9-year period, liver disorders of pregnancy and gallbladder disease were the most common hepatic diseases with rates of 7.18 and 4.65 per 1000 pregnancy hospitalizations, respectively (N = 192,940 and 297,653, respectively) (Table 1). Biliary tract disease and HELLP syndrome were less common with 69,346 (rate = 1.67/1000 pregnancy hospitalizations) and 39,365 (rate = 0.95/1000 pregnancy hospitalizations) total diagnoses, respectively. There were 39,664 pregnancy hospitalizations with a diagnosis of HBV (rate = 0.96/1000 pregnancy hospitalizations) and 70,367 pregnancy hospitalizations with a diagnosis of HCV (rate = 1.70/1000 pregnancy hospitalizations) (Table 1). Diagnosis of other viral hepatitis during pregnancy was uncommon with 0.10 per 1000 pregnancy hospitalizations (N = 4075) and the rate remained unchanged over the study period (data not shown). Chronic and alcohol-related liver disease was rare with a rate of 0.30 per 1000 pregnancy hospitalizations (N = 12,571) (Table 1).

Additionally, there were few hepatobiliary malignancies among pregnancy hospitalizations with only 90 (rate = 0.002/1000 pregnancy hospitalizations) diagnoses over the 9-year period (data not shown). No further analyses were conducted among pregnancy hospitalizations with a diagnosis of hepatobiliary malignancies or other viral hepatitis due to the rarity of the events.

The rates for all hepatic diseases during pregnancy reported in Table 1 increased over the 9-year study period (Table 1). While rare, the rates of chronic and alcohol-related liver disease and biliary tract disease during pregnancy increased >100% from 2002 through 2004 to 2008 through 2010 (Table 1).

Table 2 shows the distributions of patient age, insurance status, hospital location, and hospital region for each hepatic disease and all pregnancy hospitalizations. The distributions of these factors among all pregnancy hospitalizations are provided for reference, but were not used to calculate the $\chi^2$ *P* value. For each hepatic disease, comparisons were made between diseased and non-diseased hospitalizations.

The distributions of patient age, primary expected payer, and hospital region differed significantly between pregnancy hospitalizations with HBV or HCV and pregnancy hospitalizations without these diagnoses (Table 2). Compared with women without such a diagnosis, hospitalized pregnant women with an HBV or HCV diagnosis were older, less likely to have private insurance, and more likely to be in the Northeast and South regions of the United States. Additionally, disproportionately more pregnancy hospitalizations with HBV occurred among women in urban areas (Table 2).

Compared to pregnant women without a diagnosis of gallbladder disease, women with a diagnosis of gallbladder disease were disproportionately younger, less likely to have private insurance, more likely to be in a rural hospital, and more likely to be in the South and West regions of the United States (Table 2). Pregnant women with a diagnosis of liver disorders of pregnancy were older, less likely to have private insurance, more likely to be in an urban

hospital, and less likely to be in the Northeast region of the United States (Table 2) compared to pregnant women without such a diagnosis.

Pregnant women with a diagnosis of chronic and alcohol-related disease or biliary tract disease were disproportionately older, more likely to be in an urban hospital, and more likely to be in the Northeast and West regions of the United States compared to pregnant women without the respective diagnoses (Table 2). Pregnant women with a diagnosis of chronic and alcohol-related disease were also less likely to have private insurance. Pregnant women diagnosed with HELLP syndrome were older, more likely to be in an urban hospital, and more likely to be in the Southern region of the United States than were pregnant women who did not have a HELLP syndrome diagnosis (Table 2).

Compared to rates in 2002 through 2004, rates of pregnancy hospitalizations with hepatitis B did not change in 2005 through 2007, but did significantly increase by 17% during 2008 through 2010 after adjusting for age, insurance status, and region. For hepatitis C, gallbladder disease, liver disorders of pregnancy, chronic and alcohol-related liver disease, biliary tract disease, and HELLP syndrome there were significant increases in the adjusted rates for 2005 through 2007 and 2008 through 2010 compared to the referent time period (2002 through 2004) (Table 3).

Charges are reported in 2010 dollars and are adjusted for age, insurance status, and delivery status. Mean charges significantly increased during 2005 through 2007 and 2008 through 2010, compared to 2002 through 2004, for all pregnancy hospitalizations as well as those with a diagnosis of hepatitis C and gallbladder disease (Table 3). For all other outcomes, mean charges increased significantly only for the later period (2008 through 2010). All hepatic diseases were associated with significantly higher charges compared to all pregnancy hospitalizations (Table 3). Pregnant women with a diagnosis of HELLP syndrome had the highest mean charges at $30,129 per hospitalization during 2002 through 2004, $33,118 in 2005 through 2007, and $34,921 in 2008 through 2010, approximately 3 times the mean charges for all pregnancy hospitalizations in each time period.

In addition, Table 3 reports the ratio of the number of pregnancy hospitalizations with each hepatic disease to total number of deliveries, as well as the ratio for all pregnancy hospitalizations to number of deliveries. This ratio is a measure of the burden of serious pregnancy morbidity when a particular hepatic disease is present. The overall mean pregnancy hospitalization-to-delivery ratio showed a slight, but statistically significant, decrease in 2008 through 2010 compared to 2002 through 2004 (from 1.100-1.094), indicating a small overall decrease in the number of hospitalizations per pregnancy with time. Similarly, there was a significant but small decrease in the ratio of pregnancy hospitalizations to deliveries over time for pregnant women with a diagnosis of gallbladder disease. For all other hepatic outcomes there were no significant changes over time in the pregnancy hospitalization delivery ratio. The hospitalization-to-delivery ratio was highest for pregnancies with gallbladder disease and chronic and alcohol-related liver disease (Table 3). The hospitalization-to-delivery ratio for women with a HELLP syndrome diagnosis was the lowest.

## Comment

Gallbladder disease and liver disorders of pregnancy were the most common hepatic diseases among those studied, a finding that is consistent with previous data.[1,2,5,12-15] While gallbladder disease was more common in younger pregnant women, all other hepatic diseases were more common in older women, compared to all pregnancy hospitalizations. Diagnoses of all hepatic diseases but HELLP syndrome were more likely to be among women with public/self-pay vs private insurance. As with overall pregnancy hospitalizations, hepatic diseases were more common in urban areas. However, gallbladder disease was disproportionately represented in the rural hospitals. There were some differences in regional distribution of hepatic diseases as well.

Rates for all hepatic diseases during pregnancy increased significantly over the 3-year study intervals from 2002 through 2010. The number of overall pregnancy hospitalizations per delivery over time decreased slightly. Gallbladder disease followed a similar pattern, while no changes were observed in pregnancy hospitalization-to-delivery ratios for the other hepatic diseases studied.

Of the hepatic diseases studied, HELLP syndrome is the most costly per hospitalization, followed closely by chronic and alcohol-related liver disease. However, both diseases were rare and HELLP syndrome had the lowest hospitalization-to-delivery ratio since this condition typically occurs near or at the time of delivery. Given that pregnancies with a diagnosis of gallbladder disease and liver disorders of pregnancy were much more common and required more hospitalizations on average, gallbladder disease and liver disorders of pregnancy had a higher overall economic burden. Gallbladder disease had the highest burden of morbidity per pregnancy, as indicated by the highest pregnancy hospitalization-to-delivery ratio observed among all outcomes (1.72 overall).

In our study, there were significantly more diagnoses of HBV and HCV found in pregnancy hospitalizations than in a similar study using HCUP NIS data from 1995 through 2005.[3] This is likely due to differences in *ICD-9-CM* codes used and not wholly contributable to increases in rates over time, particularly since we observed more cases from 2002 through 2004 than previously observed in the 11-year period from 1995 through 2005.

There are several limitations in this study that are inherent to administrative data. *ICD-9-CM* coding may be influenced by many factors including reimbursement policies and temporal changes in practices, and has several imperfections, including grouping of several disorders into 1 category and lack of specific codes for others. For example, no specific code exists for AFLP or HELLP syndrome. AFLP is coded as a liver disorder of pregnancy while HELLP is coded as severe preeclampsia. The unit of measurement was the hospital admission, rather than the individual patient and patients may be represented more than once in a given year. In addition, hospitalizations usually capture more serious morbidities, and therefore may not provide a complete account of the morbidity burden of hepatic disease during pregnancy. Additionally, up to 25 *ICD-9-CM* codes were used to identify hepatic diseases, and therefore may not represent the true burden of disease since some of these may have been incidental findings from screening or discovered during the investigation of other conditions.

Strengths of the study include its large sample size and the representativeness of the sample to the US population. Few recent studies have examined the prevalence of hepatic diseases among pregnant women from a nationally representative sample in the United States, and none in such a comprehensive manner that encompasses most categories of serious hepatic morbidities during pregnancy.

Clinical care of pregnant women with hepatic diseases can be challenging. There are physiologic changes in pregnancy that affect liver function that can affect diagnostic testing and clinical monitoring. Additionally, caring for pregnant women with preexisting liver disease, such as hepatitis B and C, is difficult to manage as effects of disease and treatment must balance fetal and maternal concerns. Pregnant women may be more susceptible to or have increased severity of certain liver diseases in pregnancy (eg, gallbladder disease/cholelithiasis). These liver diseases and those that are unique to pregnancy such as HELLP syndrome, ICP, and AFLP can cause significant burden to the health care system due to the higher risk of complications for mothers and infants. Results of this analysis may aid health care policy planning by serving as a baseline for future studies of trends in prevalence as well as management of these conditions in the United States.

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**TABLE 1**

Rates of select hepatic diseases during pregnancy from 2002 through 2010, in 3-year intervals

| | 2002 through 2004 | | 2005 through 2007 | | 2008 through 2010 | | Total | |
|---|---|---|---|---|---|---|---|---|
| **Characteristic** | **n** | **Rate[a]** | **n** | **Rate[a]** | **n** | **Rate[a]** | **n** | **Rate[a]** |
| Hepatitis B | 11,740 | 0.85 | 13,902 | 0.97 | 14,022 | 1.05 | 39,664 | 0.96 |
| Hepatitis C | 17,114 | 1.25 | 24,687 | 1.72 | 28,567 | 2.13 | 70,367 | 1.70 |
| Gallbladder disease/cholelithiasis | 59,341 | 4.32 | 65,748 | 4.59 | 67,850 | 5.06 | 192,940 | 4.65 |
| Liver disorders of pregnancy[b] | 82,066 | 5.97 | 96,082 | 6.71 | 119,505 | 8.91 | 297,653 | 7.18 |
| Chronic and alcohol-related liver disease | 2758 | 0.20 | 4100 | 0.29 | 5714 | 0.43 | 12,571 | 0.30 |
| Biliary tract disease | 14,552 | 1.06 | 22,423 | 1.57 | 32,371 | 2.41 | 69,346 | 1.67 |
| HELLP syndrome | 10,854 | 0.79 | 12,340 | 0.86 | 16,171 | 1.21 | 39,365 | 0.95 |

*HELLP*, hemolysis, elevated liver enzymes, low platelet count.

[a]Per 1000 pregnancy hospitalizations;

[b]Includes acute fatty liver of pregnancy, intrahepatic cholestasis of pregnancy, icterus gravis pregnancy, necrosis of liver of pregnancy, and hepatorenal syndrome following delivery.

## TABLE 2

Distribution of patient and hospital characteristics for hepatic diseases, United States 2002 through 2010

| Variable | Hepatitis B (n = 39,664), % | Hepatitis C (n = 70,367), % | Gallbladder disease (n = 192,940), % | Liver disorders of pregnancy (n = 297,653), % | Chronic and alcohol-related liver disease (n = 12,571), % | Biliary tract disease (n = 69,346), % | HELLP syndrome (n = 39,365), % | All pregnancy hospitalizations (n = 41,479,358), % |
|---|---|---|---|---|---|---|---|---|
| Patient age, y | | | | | | | | |
| 15-24 | 25.6 | 25.7 | 44.9 | 32.5 | 24.7 | 27 | 31.9 | 35.3 |
| 25-34 | 54.5 | 53.1 | 45 | 50.5 | 52.5 | 54.2 | 48.8 | 50.4 |
| ≥35 | 19.9 | 21.3 | 10.1 | 17.1 | 22.8 | 18.9 | 19.3 | 14.4 |
| Primary expected payer | | | | | | | | |
| Private | 38.7 | 17.3 | 38.7 | 48.8 | 46.9 | 48.6[a] | 52.3[a] | 51.2 |
| Public/self-pay[b] | 61.3 | 82.7 | 61.3 | 51.2 | 53.1 | 51.4[a] | 47.7[a] | 48.8 |
| Hospital location | | | | | | | | |
| Urban | 95.2 | 88 | 86.3 | 90.7 | 94.5 | 95.4 | 94.2 | 88.3 |
| Rural | 4.8 | 12 | 13.7 | 9.3 | 5.5 | 4.6 | 5.8 | 11.7 |
| Hospital region | | | | | | | | |
| Northeast | 20.3 | 24.2 | 14.3 | 12.4 | 19.1 | 21.3 | 13.6 | 16.7 |
| Midwest | 17 | 13.9 | 19.4 | 23 | 18 | 18.1 | 19.7 | 21.5 |
| South | 39.7 | 40.4 | 40.2 | 40.4 | 36.2 | 28.2 | 44.2 | 37.7 |
| West | 23 | 21.5 | 26 | 24.3 | 26.8 | 32.4 | 22.5 | 24.0 |

*HELLP*, hemolysis, elevated liver enzymes, low platelet count.

[a] All $\chi^2$ *P* values comparing distributions of hospitalizations with and without diagnoses were significant (< .0018) except where noted;

[b] Includes Medicaid and Medicare.

## TABLE 3

Trends in pregnancy hospitalizations with select hepatic diseases and related hospital charges: 2002 through 2004, 2005 through 2007, and 2008 through 2010

| | Year | | |
|---|---|---|---|
| **Variable** | **2002 through 2004** | **2005 through 2007** | **2008 through 2010** |
| Hepatitis B | | | |
| Adjusted odds ratio (95% CI)[a] | 1.00 | 1.10 (0.98-1.24) | 1.17 (1.04-1.31) |
| Mean charges (95% CI)[b] | $11,833 ($10,889–12,777) | $11,886 ($11,192–12,580) | $15,509 ($14,099–16,920) |
| Hospitalization-to-delivery ratio (95% CI)[c] | 1.091 (1.075–1.106) | 1.080 (1.067–1.093) | 1.091 (1.077–1.106) |
| Hepatitis C | | | |
| Adjusted odds ratio (95% CI)[a] | 1.00 | 1.28 (1.14–1.45) | 1.55 (1.37–1.75) |
| Mean charges (95% CI)[b] | $12,768 ($11,817–13,720) | $14,764 ($13,429–16,099) | $16,255 ($15,081–17,429) |
| Hospitalization-to-delivery ratio (95% CI)[c] | 1.196 (1.179–1.213) | 1.210 (1.190–1.230) | 1.227 (1.207–1.248) |
| Gallbladder disease/cholelithiasis | | | |
| Adjusted odds ratio (95% CI)[a] | 1.00 | 1.05 (1.00–1.09) | 1.15 (1.10–1.20) |
| Mean charges (95% CI)[b] | $16,675 ($16,022–17,328) | $18,250 ($17,655–18,844) | $22,003 ($21,200–22,806) |
| Hospitalization-to-delivery ratio (95% CI)[c] | 1.735 (1.726–1.744) | 1.721 (1.712–1.730) | 1.704 (1.694–1.7146) |
| Liver disorders of pregnancy | | | |
| Adjusted odds ratio (95% CI)[a] | 1.00 | 1.12 (1.04–1.21) | 1.48 (1.36–1.61) |
| Mean charges (95% CI)[b] | $17,340 ($16,567–18,112) | $18,141 ($17,476–18,806) | $21,872 ($20,911–22,833) |
| Hospitalization-to-delivery ratio (95% CI)[c] | 1.295 (1.282–1.309) | 1.289 (1.278–1.301) | 1.280 (1.267–1.292) |
| Chronic and alcohol-related liver disease | | | |
| Adjusted odds ratio (95% CI)[a] | 1.00 | 1.40 (1.23–1.60) | 2.07 (1.82–2.35) |
| Mean charges (95% CI)[b] | $24,681 ($21,049–28,313) | $31,285 ($25,016–37,555) | $31,950 ($27,566–36,333) |
| Hospitalization-to-delivery ratio (95% CI)[c] | 1.411 (1.370–1.452) | 1.407 (1.371–1.443) | 1.441 (1.410–1.473) |
| Biliary tract disease | | | |
| Adjusted odds ratio (95% CI)[a] | 1.00 | 1.47 (1.29–1.68) | 2.25 (1.98–2.57) |
| Mean charges (95% CI)[b] | $15,875 ($14,314–17,436) | $17,019 ($15,834–18,204) | $19,726 ($18,430–21,022) |
| Hospitalization-to-delivery ratio (95% CI)[c] | 1.183 (1.166–1.200) | 1.180 (1.1649–1.194) | 1.156 (1.144–1.169) |
| HELLP syndrome | | | |
| Adjusted odds ratio (95% CI)[a] | 1.00 | 1.09 (1.00–1.19) | 1.52 (1.41–1.64) |
| Mean charges (95% CI)[b] | $30,129 ($27,810–32,449) | $33,118 ($30,207–36,030) | $34,921 ($32,559–37,284) |
| Hospitalization-to-delivery ratio (95% CI)[c] | 1.074 (1.063–1.0849) | 1.072 (1.061–1.083) | 1.074 (1.0645–1.084) |
| All pregnancy hospitalizations | | | |
| Mean charges (95% CI)[b] | $9844 ($9501–10,188) | $10,995 ($10,687–11,302) | $12,910 ($12,496–13,325) |
| Hospitalization-to-delivery ratio (95% CI)[c] | 1.100 (1.097–1.102) | 1.097 (1.0946–1.099) | 1.094 (1.091–1.096) |

*CI*, confidence interval; *HELLP*, hemolysis, elevated liver enzymes, low platelet count.

[a] Adjusted for age group, primary expected payer, and hospital region;

[b] Standardized using 2010 Consumer Price Index, adjusted for age group, expected payer, and delivery status;

[c] Ratio of number of hospitalizations with each outcome to total number of deliveries in same time period.