Evaluation and Management of Hepatitis B in Pregnancy: A Survey of Current Practices

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Abstract: ***Background:*** Optimal management of hepatitis B (HBV) during pregnancy is unclear. Safety and efficacy data of antiviral therapy are limited. We assessed the practice patterns of hepatologists, gastroenterologists, and other physicians for evaluating and managing pregnant patients with HBV as well as the variation of these practice patterns by primary specialty and practice description. ***Methods:*** An 18-question electronic survey was sent to physicians with a special interest in liver disease addressing the evaluation and management of HBV during pregnancy. ***Results:*** A total of 226 physicians responded, of whom 68.5% characterized their primary specialty as hepatology, 26.5% as gastroenterology, and 4.9% as other; 62.4% were academic-based physicians, and 37.6% were community-based physicians. The average years in practice were 13.3. Initiation of antiviral therapy during pregnancy was supported by 51.8% of respondents. Of those against therapy initiation, 60.4% cited a lack of clear recommendations, 32.1% cited safety concerns, and 7.5% cited a lack of efficacy. For patients on antivirals who desired to become pregnant, 74.8% of respondents would continue antiviral therapy. The most common antiviral used in pregnancy was lamivudine (72.1%). HBV vaccination and HBV immunoglobulin for infants born to mothers with HBV were recommended by 98.7% of respondents; 57.5% would also recommend breastfeeding. If antivirals were being used, only 30.5% of respondents would still recommend breastfeeding. More hepatologists were "very comfortable" ($P=.032$) managing these patients compared to nonhepatologists. ***Conclusions:*** There is significant heterogeneity in the management of pregnant patients with HBV regardless of primary specialty or practice description. This variability likely reflects a lack of data and specific guidelines. Further research and more specific guidelines are needed.

Chronic hepatitis B virus (HBV) affects up to 400 million individuals worldwide.[1] It is estimated that 1.25 million individuals in the United States are chronically infected.[2,3] Up to 15–40% of individuals with chronic HBV die prematurely from cirrhosis or hepatocellular carcinoma.[4] Worldwide, vertical transmission remains the most frequent route of infection,

particularly in endemic areas where up to 20% of women of childbearing age may have HBV. These women constitute a reservoir for perinatal transmission, which is associated with a very high rate of chronicity (up to 90%).[5-7]

Even with the use of appropriate prophylaxis with HBV immunoglobulin (HBIG) and HBV vaccination, a significant risk of vertical transmission remains, particularly in mothers with high viral loads and positive hepatitis B e antigen (HBeAg) status. An HBV DNA level greater than 10^7 genome equivalents/mL is a risk factor for HBV transmission.[8,9]

Given the correlation between high HBV DNA levels and the risk of vertical transmission, investigators have studied the use of antivirals to prevent HBV transmission. However, data on the safety and efficacy of antiviral treatment of HBV in pregnancy remain limited. Currently, the US Food and Drug Administration lists telbivudine (Tyzeka, Novartis) and tenofovir (Viread, Gilead) as pregnancy category B drugs. Lamivudine (Epivir, GlaxoSmithKline), entecavir (Baraclude, Bristol-Myers Squibb), adefovir (Hepsera, Gilead), and emtricitabine (Emtriva, Gilead) are listed as pregnancy category C drugs.

Lamivudine has been the most extensively studied antiviral agent in pregnant patients. A report of 38 women with chronic HBV who became pregnant while on lamivudine revealed that none of their babies were hepatitis B surface antigen (HBsAg)-positive at 1 year compared to 26% of historical controls.[10] Lamivudine treatment of HBV in pregnancy was also associated with a reduction in both maternal and fetal complications. A study of 8 women who were HBeAg-positive with a high HBV DNA level (>1.2×10^9 genome equivalents/mL) treated with lamivudine during the last 4 weeks of pregnancy revealed that 1 of 8 (12.5%) of the babies was HBsAg-positive at 1 year compared to 7 of 25 (28%) historical controls.[11] A randomized, double-blind, placebo-controlled, clinical trial reported that lamivudine treatment during the last 8 weeks of pregnancy reduced vertical transmission compared to HBIG and HBV vaccination alone.[12] However, this study was notable for a high (39%) rate of vertical transmission despite HBIG and HBV vaccination. Finally, a case report of vertical transmission despite long-term maternal lamivudine treatment with undetectable HBV DNA levels suggested a persistent risk of vertical transmission despite lamivudine treatment.[13] None of these studies reported an increase in maternal or fetal adverse events with lamivudine.

Although tenofovir and telbivudine are listed as pregnancy category B drugs, there have been no published studies using these drugs in pregnant women with HBV. There have also been no other published studies using entecavir, adefovir, or emtricitabine for preventing HBV vertical transmission.

Table 1. Demographics of Survey Respondents

Number of complete respondents	226
Years in practice	13.3 (range, 1–45)
Specialty	
Hepatology	155 (68.5%)
Gastroenterology	60 (26.5%)
Other	11 (4.9%)
Current practice	
Academic-based	141 (62.4%)
Community-based	85 (37.6%)

In the absence of conclusive data, the optimal approach to the management of these patients is unclear. The Centers for Disease Control and Prevention and the American Association for the Study of Liver Diseases (AASLD) have not made any specific recommendations for antiviral treatment of pregnant women with HBV.[14,15] The HBV treatment algorithms from Keeffe and colleagues published in 2006 and 2008 recommended individualization of therapy for pregnant HBV patients.[16,17]

There has been no previous survey on the practice patterns of physicians for managing pregnant patients with HBV. Due to the absence of robust data and specific treatment guidelines, we postulated that there would be significant heterogeneity in managing these patients. Accordingly, we sought to evaluate the practice patterns of physicians with regard to HBV evaluation and management in pregnant women. In addition, we sought to determine the heterogeneity of these practice patterns by primary specialty and practice description. We thought that identification of practice patterns and evaluation of their heterogeneity could guide and highlight the need for further research, lead to the strengthening of guidelines, and improve education of physicians regarding the management of this challenging patient population.

Materials and Methods

We developed an 18-item online survey using SurveyMonkey (www.surveymonkey.com) to assess the practice patterns of physicians managing pregnant patients with chronic HBV. The survey assessed physician demographic and practice information, as well as evaluation and management patterns of pregnant women with chronic HBV. Electronic survey invitations were sent to a list of physicians identified as members of an organization dedicated to the study of liver disease. The data collection period was 4 weeks and included 1 reminder e-mail invitation.

Table 2. Evaluation of HBV in Pregnancy by Practice Description and Specialty

		Total		Academic-based		Community-based			Hepatology		Nonhepatology		
		n= 226	%	n= 141	%	n= 85	%	*P*	n= 155	%	n= 71	%	*P*
What is the risk of HBV transmission to the fetus from mothers with chronic HBV?	High	136	60.2	77	54.6	59	69.4	.04	91	58.7	45	63.4	.60
	Moderate	58	25.7	40	28.4	18	21.2	.30	40	25.8	18	25.4	.92
	Low	30	13.3	23	16.3	7	8.2	.13	23	14.8	7	9.9	.42
	Unsure	2	0.9	1	0.7	1	1.2	.71	1	0.6	1	1.4	.84
Tests obtained during initial evaluation	HBsAg	187	82.7	114	80.9	73	85.9	.43	125	80.6	62	87.3	.3
	HBeAg	192	85	114	80.9	78	91.8	.042	129	83.2	63	88.7	.38
	HBeAb	161	71.2	94	66.7	67	78.8	.071	111	71.6	50	70.4	1
	HBV DNA level	209	92.5	129	91.5	80	94.1	.64	143	92.3	66	93.0	.92
	HBV genotype	53	23.5	30	21.3	23	27.1	.41	36	23.2	17	23.9	1
	HBV resistance panel	36	15.9	22	15.6	14	16.5	1	29	18.7	7	9.9	.14
Tests used to guide treatment initiation	Liver function tests	157	69.5	95	67.4	62	72.9	.47	105	67.7	52	73.2	.50
	HBV DNA level	216	95.6	134	95.0	82	96.5	.86	150	96.8	66	93.0	.34
	HBeAg status	120	53.1	72	51.1	48	56.5	.52	76	49.0	44	62.0	.10
	HBV genotype	12	5.3	8	5.7	4	4.7	1.00	8	5.2	4	5.6	.86
	HBV resistance panel	21	9.3	13	9.2	8	9.4	.84	13	8.4	8	11.3	.66
	Liver biopsy	53	23.5	36	25.5	17	20.0	.43	39	25.2	14	19.7	.47

HBeAb=hepatitis B e antibody; HBeAg=hepatitis B e antigen; HBsAg=hepatitis B surface antigen; HBV=hepatitis B virus.

Analysis Tools

We used the chi-square statistic to compare proportional differences between physicians in academic- compared to community-based practices as well as hepatologists compared to nonhepatologists. Analyses were performed using Stata (StataCorp LP) analysis tools.

Results

Demographics

A total of 2,430 US and international physicians were surveyed, of whom 226 (9.3%) US physicians responded. No surveys were discarded. Table 1 summarizes the demographics of the respondents.

Evaluation of Hepatitis B Virus During Pregnancy

Table 2 outlines the evaluation patterns by practice description and specialty. The risk of vertical transmission of HBV to the fetus was characterized as high or moderate by 194 (85.8%) respondents, whereas only 30 (13.3%) would characterize the risk as low. There were no significant differences in evaluation patterns by practice

description or primary specialty, with the exception that community-based physicians were more likely to obtain an HBeAg test during the initial evaluation (*P*=.042) and inform their pregnant HBV patient of a high risk of vertical transmission of HBV (*P*=.04). Although only 1.8% of respondents answered an earlier question that they would obtain a liver biopsy, 53 (23.5%) reported that liver biopsy results, if available, would be used to guide treatment initiation. The HBV resistance panel and genotype would be utilized by only 21 (9.3%) and 12 (5.3%) of the respondents, respectively, in their decision to treat.

Management of Hepatitis B Virus During Pregnancy

Table 3 provides details for the management-related questions surveyed. With regard to the comfort level of managing pregnant patients with HBV, 68 (30.1%) of respondents were "very comfortable," 69 (30.5%) were "comfortable," 52 (23.0%) were "somewhat comfortable," and 37 (16.4%) were "not comfortable." There were no statistically significant differences between academic- versus community-based practices in the comfort level of managing these patients. However, more hepatologists, 54 of 155 (34.8%), felt "very comfortable" versus 14 of 71 (19.7%) of nonhepatologists (*P*=.032). Only 16 of 155 (10.3%) of hepatologists were "not comfortable" versus 21 of 71 (29.6%) of nonhepatologists in managing pregnant women with chronic HBV (*P*=.0006).

As for treatment initiation, 51.8% of respondents would initiate treatment during pregnancy in patients with a new diagnosis of HBV during the first trimester of pregnancy, whereas 109 (48.2%) would wait until after delivery. Approximately 13% would initiate treatment upon diagnosis regardless of the trimester of the pregnancy, whereas 78.9% would wait until the third trimester. Of the 109 respondents who would wait until after delivery, 106 explained their reasoning for deferring therapy: a lack of recommendations (60.4%), a lack of evidence to support efficacy (7.5%), and safety concerns (32.1%). When questioned about which agents they would recommend during pregnancy (the respondents were allowed to mark as many as they felt appropriate), 72.1% chose lamivudine, followed by telbivudine (35.3%), tenofovir (20.1%), entecavir (13.7%), adefovir (7.8%), pegylated interferon (0.5%), and standard interferon (0.5%). For women who desire to become pregnant while on antiviral therapy for HBV, 169 (74.8%) of respondents would continue antiviral therapy and 56 (24.8%) would stop antiviral therapy.

With regard to overall management of HBV in pregnancy, there were no significant differences according to practice description and primary specialty, with the exception that more community-based physicians recommended initiating antiviral therapy during the third trimester (*P*=.01). In addition, nonhepatologists were more likely to recommend that antiviral therapy be stopped at delivery (*P*=.02).

Table 4 outlines the management of patients who become pregnant while on antiviral therapy for chronic HBV. Approximately 80% of respondents would continue antiviral therapy. These respondents were then asked to identify whether they would continue the same medication or switch to another antiviral agent. For patients on lamivudine, 90% would continue with the same medication; likewise, 72.1% would continue telbivudine, 53.4% would continue tenofovir, 38.8% would continue adefovir, and 36.5% would continue entecavir.

Hepatitis B Virus Management During the Postpartum Period

Table 5 shows details of postpartum management, including the findings that 206 (91.2%) respondents would recommend HBV vaccination and HBIG to infants born to mothers with HBV, and 17 (7.5%) would recommend oral antiviral therapy in addition to HBV vaccination and HBIG. In addition, 130 (57.5%) would recommend breastfeeding by women with HBV, whereas 32 (14.2%) were unsure about breastfeeding. If patients were on antiviral therapy, 69 (30.5%) respondents would recommend breastfeeding, whereas 57 (25.2%) were unsure. There were no significant differences in postpartum management of HBV according to practice description and primary specialty.

Discussion

Given the lack of data on the optimal evaluation and management of pregnant patients with HBV, this survey was administered to examine the patterns of physicians treating pregnant women with HBV.

The initial and subsequent evaluation patterns for pregnant HBV patients were very homogeneous. However, in contrast, there was significant heterogeneity with regard to management. In fact, there was complete disagreement in the decision to initiate HBV therapy in a newly diagnosed pregnant woman with HBV in the first trimester: approximately half of the respondents would initiate antiviral therapy during pregnancy, whereas the other half would delay therapy until after delivery. The variability of responses also extended to the timing of treatment cessation, the management of patients already on antiviral treatment who were planning a pregnancy, as well as the choice of antiviral therapy. This heterogeneity likely reflects the result of the limited data and lack of formal recommendations.

There was a greater reported comfort level among hepatologists in managing pregnant women with HBV, possibly reflecting greater exposure to these patients. However, only approximately 70% felt "comfortable"

Table 3. Management of HBV in Pregnancy by Practice Description and Specialty

		Total		Academic-based		Community-based			Hepatology		Nonhepatology		
		n	%	n	%	n	%	*P*	n	%	n	%	*P*
How comfortable do you feel managing pregnant women with chronic hepatitis B? (total respondents, n=226)	Very comfortable	68	30.1	47	33.3	21	24.7	.22	54	34.8	14	19.7	.032
	Comfortable	69	30.5	42	29.8	27	31.8	.86	53	34.2	16	22.5	.11
	Somewhat comfortable	52	23	34	24.1	18	21.2	.73	32	20.6	20	28.2	.28
	Not comfortable	37	16.4	18	12.8	19	22.4	.09	16	10.3	21	29.6	.0006
In a pregnant woman with a new diagnosis of HBV in the first trimester: (n=226)	Initiate antiviral therapy during pregnancy	117	51.8	71	50.4	46	54.1	.68	78	50.3	39	54.9	.62
	Wait until after delivery	109	48.2	70	49.6	39	45.9	-	77	49.7	32	45.1	-
If you recommended antiviral therapy during pregnancy, at what point do you initiate treatment: (n=166)	Upon diagnosis of HBV	21	12.7	16	16.2	5	7.5	.15	14	12.4	7	13.2	.92
	In the first trimester	0	0.0	0	0.0	0	0.0	-	0	0.0	0	0.0	-
	In the second trimester	14	8.4	12	12.1	2	3.0	.07	11	9.7	3	5.7	.56
	In the third trimester	131	78.9	71	71.7	60	89.6	.010	88	77.9	43	81.1	.78
If you do not recommend antiviral therapy for pregnant patients, why not? (n=106)	Lack of evidence to support efficacy during pregnancy	8	7.5	8	10.7	0	0.0	.14	7	9.5	1	3.1	.46
	Lack of evidence to support safety during pregnancy	34	32.1	22	29.3	12	38.7	.48	24	32.4	10	31.3	.92
	Absence of appropriate guidelines	64	60.4	45	60.0	19	61.3	.92	43	58.1	21	65.6	.61
If you recommended antiviral therapy during pregnancy, at what point do you stop treatment? (n=198)	At delivery	12	6.1	4	3.3	8	10.3	.09	4	3.0	8	12.7	.02
	4 weeks postpartum	32	16.2	19	15.8	13	16.7	1.00	26	19.3	6	9.5	.13
	Upon HBV DNA becoming undetectable	18	9.1	12	10.0	6	7.7	.76	11	8.1	7	11.1	.68
	Upon eAg+ to eAb+ seroconversion	136	68.7	85	70.8	51	65.4	.52	94	69.6	42	66.7	.81
If antiviral therapy is initiated during pregnancy, which antiviral agent would you recommend? (n=204)	Interferon	1	0.5	1	0.8	0	0.0	.81	0	0.0	1	1.6	.68
	Lamivudine	147	72.1	88	69.3	59	76.6	.33	103	73.0	44	69.8	.76
	Adefovir	16	7.8	11	8.7	5	6.5	.78	11	7.8	5	7.9	.81
	Entecavir	28	13.7	18	14.2	10	13.0	1.00	17	12.1	11	17.5	.41
	Tenofovir	41	20.1	28	22.0	13	16.9	.48	34	24.1	7	11.1	.051
	Telbivudine	72	35.3	46	36.2	26	33.8	.84	55	39.0	17	27.0	.13
	Pegylated interferon	1	0.5	1	0.8	0	0.0	.81	0	0.0	1	1.6	.68
For patients already on antiviral therapy for HBV who desire to become pregnant, do you: (n=226)	Stop antiviral therapy	56	24.8	34	24.1	22	25.9	.8875	41	26.5	15	21.1	.488
	Continue antiviral therapy	169	74.8	107	75.9	62	72.9	.7401	113	72.9	56	78.9	.427
	Add a second agent	1	0.4	0	0.0	1	1.2	.8065	1	0.6	0	0.0	.689

eAb= e antibody; eAg= e antigen; HBV=hepatitis B virus.

Table 4. Antiviral Therapy Adjustments in Pregnancy

If a patient is already on antiviral therapy for HBV and becomes pregnant, what would you do in each of the following situations?	Patient on lamivudine	Patient on adefovir	Patient on entecavir	Patient on tenofovir	Patient on telbivudine
Stop rx	27	41	41	43	37
%	11.9	18.1	18.1	19	16.4
Not sure	9	8	4	9	17
%	4	3.5	1.8	4	7.5
Continue therapy	190	178	181	174	172
%	84.1	78.8	80.1	77	76.1
Continue same medication	171	69	66	93	124
%	90	38.8	36.5	53.4	72.1
Switch to lamivudine	NA	52	54	46	37
%	NA	29.2	29.8	26.4	21.5
Switch to adefovir	1	NA	0	2	2
%	0.5	NA	0	1.1	1.2
Switch to entecavir	2	2	NA	1	2
%	1.1	1.1	NA	0.6	1.2
Switch to tenofovir	3	18	17	NA	7
%	1.6	10.1	9.4	NA	4.1
Switch to telbivudine	13	37	44	32	NA
%	6.8	20.8	24.3	18.4	NA

HBV=hepatitis B virus.

or "very comfortable" in taking care of these patients, whereas approximately 10% felt "not comfortable." Despite the greater reported comfort level by hepatologists, there was still significant heterogeneity in their management recommendations.

The lack of guidelines was the most commonly cited reason for not recommending antiviral therapy in our survey. The 2006 Keeffe guidelines recommended that the "decisions about initiating and/or continuing antiviral therapy in pregnant women should depend on the stage of the mother's liver disease and her potential benefit versus the small risk to the fetus."[16] These recommendations are similar to the recommendations from the 2007 National Institutes of Health (NIH) clinical research workshop on the management of HBV, which stated that "these agents could be used if the potential benefit of treating during pregnancy is believed to outweigh potential risks to mother or fetus."[18] Given the fact that these guidelines, similar to the 2007 AASLD guidelines, provided general management strategies rather than specific recommendations, it is not surprising that there was significant variability in the respondents' decisions to initiate, continue, or stop antiviral therapy.[19]

Our survey was completed prior to the publication of more recent guidelines, and, thus, the impact of these new recommendations could not be assessed. The 2008 Keeffe treatment algorithm did make some limited recommendations for treatment in this patient population.[17] They suggested that antiviral therapy with lamivudine, telbivudine, or tenofovir could be given during the third trimester in women with HBV DNA levels greater than 10^7 copies/mL and elevated alanine aminotransferase levels, or who already have had an HBsAg-positive child. The 2009 AASLD guidelines had no new specific treatment recommendations in this patient population.[15]

The establishment of firm, specific guidelines can have a significant impact on physician practice patterns. In fact, the only part of our survey that showed a near 100% consensus was the recommendation to administer HBIG within 12 hours of delivery along with HBV vac-

Table 5. Management in the Postpartum Period by Practice Description and Specialty

		Total		Academic-based		Community-based			Hepatology		Nonhepatology		
		n= 226	%	n= 141	%	n= 85	%	*P*	n= 155	%	n= 71	%	*P*
Which of the following do you recommend to infants born to mothers with chronic HBV?	HBV vaccination alone	1	0.4	0	0.0	1	1.2	.81	0	0.0	1	1.4	.69
	HBIG alone	2	0.9	1	0.7	1	1.2	.71	2	1.3	0	0.0	.84
	Oral antiviral therapy alone	0	0	0	0.0	0	0.0	-	0	0.0	0	0.0	-
	HBV vaccination and HBIG	206	91.2	126	89.4	80	94.1	.33	140	90.3	66	93.0	.69
	HBV vaccination, HBIG, and oral antiviral therapy	17	7.5	14	9.9	3	3.5	.13	13	8.4	4	5.6	.65
Do you recommend breastfeeding by women with chronic HBV?	Yes	130	57.5	83	58.9	47	55.3	.70	92	59.4	38	53.5	.50
	No	64	28.3	38	27.0	26	30.6	.66	39	25.2	25	35.2	.16
	Unsure	32	14.2	20	14.2	12	14.1	.86	24	15.5	8	11.3	.52
Do you recommend breastfeeding by women with chronic HBV on antiviral therapy?	Yes	69	30.5	47	33.3	22	25.9	.30	46	29.7	23	32.4	.79
	No	100	44.3	60	42.6	40	47.1	.60	65	41.9	35	49.3	.37
	Unsure	57	25.2	34	24.1	23	27.1	.74	44	28.4	13	18.3	.15

HBIG=hepatitis B virus immunoglobulin; HBV=hepatitis B virus.

cination to infants born to mothers with HBV, which is clearly recommended by the Advisory Committee on Immunization Practices.[14] However, the impact of specific guidelines may be limited by a failure to disseminate the information across subspecialties. For example, despite the position from the American Academy of Pediatrics stating that breastfeeding is not contraindicated in women with HBV (not on antiviral therapy), only 57.5% of respondents in our survey recommended it.[20] In addition, 30.5% of respondents recommended breastfeeding in women using oral antiviral agents despite warnings to the contrary on the specific antiviral drug package inserts.[21-25]

For patients who become pregnant while on HBV therapy, the majority of respondents would continue lamivudine or telbivudine, whereas approximately half would continue tenofovir. For those respondents who would opt to switch agents, lamivudine was the most popular, followed by telbivudine and tenofovir. Lamivudine was the first available oral agent for HBV therapy with initial studies showing no increase in maternal or fetal adverse events.[10-13] Despite lamivudine's pregnancy category C status and its high resistance rate, it was the preferred agent in our survey, suggesting that experience and comfort level with the use of a drug trumps concerns regarding its pregnancy category, perceived safety, and resistance risk. Tenofovir's long availability for HIV treatment may also have contributed to greater experience and comfort level. The preference to continue telbivudine may be related to its perceived safety based upon its pregnancy category B status. Hesitation to continue adefovir and entecavir may reflect their less favorable pregnancy category and perceived safety concerns.

Fear of adverse events remained a commonly cited reason to withhold antiviral therapy in HBV in our survey, particularly during the first and second trimesters. The Antiretroviral Pregnancy Registry (APR) monitors the safety of antiretroviral agents in the United States and, as of July 2008, has enrolled nearly 4,000 pregnant women who have been exposed to lamivudine, tenofovir, emtricitabine, or other antiviral drugs.[26] Despite the large number of enrolled patients and reassuring results showing no significant increase in birth defects, the limitations of the APR in generalizing these findings from a mainly HIV population to HBV patients likely contributed to the persistent fears of adverse events. Similar registries sponsored by the pharmaceutical industry have been severely limited by poor enrollment and provide little meaningful data.

Our study is limited by its nature as a survey. The questionnaire itself was limited due to the need for brevity and ease of response. The questions were deliberately few and limited in complexity in order to accommodate the limitations of the survey format and to encourage responses. As such, the questionnaire may not have had the necessary detail to accurately capture subtle differences in practice patterns. There was a substantial number of total respondents (n=226).

The survey target group consisted of physicians identified as members of a society dedicated to the study of liver disease. The assumption of the survey was that this group of physicians would be most familiar with managing these patients. However, by limiting our survey to this group of physicians, we may have introduced a bias toward academic hepatologists and gastroenterologists with an interest in hepatology, and the findings may not reflect community-based gastroenterology physician practice. In addition, given the fact that there has only recently been an actual board certification in (transplant) hepatology, it is somewhat unclear how respondents decided to identify themselves as "hepatologists" versus "gastroenterologists." Surveying gastroenterologists who were not members of this society may have strengthened the generalizability of the findings and underscored any subtle differences in management by primary specialty or practice description. In addition, obstetricians, internists, and other physicians, particularly if they practice in communities with a high prevalence of HBV, may be quite comfortable and experienced in the evaluation and management of these patients. Exclusion of these physicians from the survey may have further limited the generalizability of the findings. Nevertheless, this is the first survey of its kind studying the practice patterns of physicians managing this challenging patient population.

In summary, despite its limitations, this is the first study to provide a cross-sectional picture of the practice patterns of managing pregnant patients with HBV. It is obvious that there is considerable variability in current practice patterns regardless of primary specialty or practice description. Hepatologists and academic-based physicians who might have been expected to have greater familiarity and comfort with these patients were found to be as heterogeneous as nonhepatologists and community-based physicians in their management of these patients. More than 30% of hepatologists still considered themselves only "somewhat" or "not" comfortable managing this patient population. None of the surveyed subgroups appeared to have a consistent approach to optimally manage pregnant women with HBV. Accordingly, the results of our survey suggest that, depending upon the individual physician, the same patient may receive significantly different care. This variability of management, regardless of primary specialty, practice description, or reported comfort level, reflects the absence of published data and guidelines.

The NIH consensus development conference on HBV published in 2009 identified one of its research priorities as studying the use of antiviral therapy in pregnancy to reduce vertical transmission.[27] Ongoing efforts should continue to develop multicenter studies in this patient population to provide robust data to guide management and formulate updated, evidence-based guidelines. This research and strengthening of guidelines with the inclusion of specific recommendations, along with physician education, will help improve and standardize the management of pregnant women with HBV. It is important to note that, given the dearth of safety data, any pregnant patient with HBV treated with antiviral therapy should be reported to a pregnancy registry. A follow-up, more in-depth survey is planned to determine the impact of the recently updated and future guidelines on management of HBV in pregnant patients.

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