A Neonatal Hepatitis B Surveillance and Vaccination Program: New York City, 1987 to 1988

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ABSTRACT

From July 1987 to June 1988, 1030 pregnant women with hepatitis B were reported to a New York City surveillance program. Among 832 infants under follow-up, the coverage rates for combined hepatitis B immune globulin and vaccine doses 1, 2, and 3 were 84%, 77%, and 59%, respectively. Infants covered by Medicaid and uninsured Black and Hispanic infants were significantly less likely to be completely vaccinated. An estimated 160 cases of chronic hepatitis B infection were prevented among infants enrolled in the program. Strategies are needed to improve vaccine coverage among hard-to-reach groups. (*Am J Public Health.* 1992;82:885–888)

Introduction

Hepatitis B virus (HBV) transmission from mother to infant during the perinatal period is highly efficient.[1–4] If the infant is not infected in the postnatal period, subsequent exposure to the mother or to other HBsAg-positive family members can lead to infection and chronic carriage.[5,6] Treatment of infants born to HBsAg-positive mothers with hepatitis B immune globulin (HBIG) and hepatitis B (HB) vaccine results in an 85% to 95% reduction in the carrier state.[7–9]

Women at high risk for hepatitis B carriage include women of Asian or Pacific Island descent, women born in Haiti or sub-Saharan Africa, and women who are intravenous drug abusers. In 1986, almost 2500 infants were born to high-risk mothers in New York City.[10] In the same year, the New York City Department of Health (NYCDOH) began a surveillance and vaccination program for HBsAg-positive pregnant women and their newborns.

Methods

The surveillance system for HBsAg-positive pregnant women included both active and passive components. Active surveillance targeted 13 New York City hospitals (8 municipal and 5 voluntary) serving high-risk populations. Yearly, about 40 000 births, representing 30% of all births in the city, occurred at these 13 hospitals. Five of the hospitals served large Asian communities. NYCDOH field workers reviewed hospital laboratory logs monthly and collected identifying information for HBsAg-positive pregnant women. Passive reporting sources included Maternity Infant Care, a New York State and federally funded family planning project; a large health maintenance organization with 895 000 subscribers; private physicians; and nonprogram hospitals.

NYCDOH workers contacted the HBsAg-positive women by telephone, letter, or home visit. A questionnaire was administered and women were counseled (in English, Spanish, Chinese, French, or Creole) regarding HBV transmission, the importance of screening household contacts, and the need for neonatal HB vaccination.

To facilitate administration of HBIG and the first dose of HB vaccine, all women enrolled in the program were given a letter from the NYCDOH stating their surface antigen status. Women were encouraged to take this letter to the hospital at the time of delivery. An infant was considered to have been given HBIG and vaccine dose 1 if a form documenting administration was received by the program or if the mother could clearly describe the administration of vaccine. Each infant was then followed, via multiple telephone calls to the mother and to the infant's caregiver, to ensure vaccination at 1 and 6 months of age. Infants for whom receipt of vaccine dose 3 could not be documented by 18 months of age were considered lost to follow-up.

The surveillance program was budgeted at less than $200 000 per year; screening of the pregnant women, provision of HBIG, and provision of the first dose of HB vaccine were not covered by the program.

Statistical analysis was done using standard microcomputer software (EpiInfo, Centers for Disease Control) and exact confidence intervals for relative risks were calculated using the methods of Thomas and Gart, where appropriate.[11]

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TABLE 1—HBIG and Vaccine Coverage by Dose for 832 Infants, Hepatitis B Surveillance and Vaccination Program, New York City, July 1987 to June 1988

HBIG/Vaccine Dose	Infants Receiving HBIG/Vaccine	
	No.	%
HBIG	706	85
1	810	97
2	738	89
3	554	67
HBIG + 1	702	84
HBIG + 1 + 2	637	77
HBIG + 1 + 2 + 3	493	59

Results

In the 1-year period from July 1, 1987, through June 30, 1988, 1030 HBsAg-positive women were identified. The 13 participating hospitals screened 20 108 pregnant women; 488 (2.4%) were HBsAg positive. Three hundred forty-two HBsAg-positive women were reported from passive surveillance sources. The remaining 200 HBsAg-positive women were identified in the postpartum period and reported to the NYCDOH shortly after delivery (median, 10 days).

The study population consisted of 830 (81%) of the 1030 positive women. Reasons for exclusion from further study were as follows: 89 women did not respond to health department calls or letters, 50 provided insufficient locating information, 30 moved before delivery, 26 seroconverted to antigen-negative status before delivery, and 3 aborted or miscarried.

The 830 women delivered 832 infants. The combined HBIG and vaccine dose 1, 2, and 3 coverage rates were 84%, 77%, and 59%, respectively (Table 1). Delivery of HBIG and three doses of vaccine was similar among infants of women identified during the antepartum and postpartum periods (61% vs 56%, $P = .18$). The majority (80%) of infants received HBIG and the subsequent vaccine doses within the recommended dosage schedule.[12]

Questionnaires were completed on 670 (81%) of the 830 HBsAg-positive women. Vaccine completion varied by maternal race/ethnicity, maternal birthplace, and health insurance (Table 2). Infants of Black and Hispanic women were 24% and 37% less likely, respectively, to complete the series than were Asian infants. Infants of women who were Medicaid recipients were almost 30% less likely to complete the series than were infants covered by private insurance.

To evaluate health insurance as a possible confounder for the racial differences observed, vaccine completion rates by maternal race were stratified by health insurance (Table 3). Vaccine completion by race among women with private insurance or Medicaid was similar; however, in

TABLE 2—Vaccine Completion Rates by Maternal Characteristics, Hepatitis B Surveillance and Vaccination Program, New York City, July 1987 to June 1988

Maternal Characteristic	Total Infants[a]	Vaccine Series Completed		RR	95% CI	*P* Value
		No.	%			
Age, y						
<18	63	38	60	0.90	0.73, 1.11	.31
≥18	607	405	67	1.00	reference	...
Race/ethnicity						
Asian	411	304	74	1.00	reference	...
Black	158	89	56	0.76	0.66, 0.88	<.005
Hispanic	73	34	47	0.63	0.49, 0.81	<.005
White	23	14	61	0.82	0.59, 1.15	.17
Maternal birthplace						
Asia[b]	355	265	75	1.00	reference	...
United States	70	35	50	0.67	0.53, 0.85	<.005
Haiti	56	38	68	0.91	0.75, 1.10	.28
Dominican Republic	39	17	44	0.58	0.41, 0.84	<.005
Pacific Island	13	10	77	1.03	0.62, 1.27	1.00*
Other[c]	80	46	58	0.77	0.63, 0.94	<.005
Health insurance						
Private	247	182	74	1.00	reference	...
None	174	123	71	0.96	0.85, 1.08	.50
Medicaid	123	66	54	0.73	0.61, 0.87	<.005
Intravenous drug abuse						
Yes	11	6	55	0.80	0.36, 1.20	.34*
No	566	388	69	1.00	reference	...
Total	630	443	66			

Note. RR = relative risk; CI = confidence interval.
[a]Groups by factors may not add to 670 because of nonresponses.
[b]Asian birthplaces include Burma, Cambodia, China, Hong Kong, India, Japan, Korea, Laos, Pakistan, Singapore, Taiwan, Thailand, and Vietnam.
[c]Other birthplaces include Antigua, Afghanistan, Barbados, Belize, Colombia, Costa Rica, Dominica, Ecuador, Grenada, Greece, Guyana, Honduras, Israel, Italy, Jamaica, Libya, Niger, Nigeria, Nauru, Panama, Poland, Puerto Rico, Saudi Arabia, Sierra Leone, Trinidad, USSR, Venezuela, and Yugoslavia.
*Exact CI and two-tailed Fisher's exact p value.

TABLE 3—Vaccine Completion Rates by Maternal Race, Stratified by Health Insurance, Hepatitis B Surveillance and Vaccination Program, New York City, July 1987 to June 1988

Maternal Race/Ethnicity	Total Infants	Vaccine Series Completed		RR	95% CI	*P* Value
		No.	%			
Private Health Insurance						
Asian	194	147	76	1.00	reference	...
Black	33	21	64	0.84	0.64, 1.10	0.14
Hispanic	17	12	71	0.93	0.68, 1.28	0.64
White	3	2	67	0.88	0.16, 1.30	0.57*
No Health Insurance						
Asian	111	89	80	1.00	reference	...
Black	42	23	55	0.68	0.51, 0.91	<0.005
Hispanic	13	5	38	0.48	0.24, 0.96	<0.005
White	8	6	75	0.94	0.45, 1.23	0.66*
Medicaid						
Asian	31	18	58	1.00	reference	...
Black	57	31	54	0.94	0.64, 1.37	0.74
Hispanic	27	12	44	0.77	0.46, 1.28	0.30
White	7	4	57	0.98	0.32, 1.75	1.00*

Note. RR = relative risk; CI = confidence interval.
*Exact CI and two-tailed Fisher's exact *P* value.

the uninsured category, infants of Black and Hispanic women remained much less likely to complete the vaccine series than were Asian infants.

To evaluate the impact of this program, we compared completion rates for infants who received the first vaccine dose at the 13 program hospitals with those who received the first dose at nonprogram hospitals. Although 373 (73%) of the 514 infants who received dose 1 at program hospitals went on to complete the series, only 68 (59%) of the 116 infants who received dose 1 at nonprogram hospitals did so (relative risk = 1.24, 95% confidence interval = 1.05, 1.46). This difference persisted after we adjusted for maternal race and health insurance coverage.

We used the following assumptions to estimate the number of cases of chronic HBV infection prevented: (1) a 25% HBeAg positivity rate for the HBsAg-positive women[2,13]; (2) in the absence of vaccination, a 90% HBV transmission rate to infants of HBeAg-positive women, with a 90% chronic carriage rate for these infants[1,2]; (3) in the absence of vaccination, a 20% chronic carriage rate for infants born to HBeAg-negative women; and (4) a vaccine efficacy of 92%.[3,4,13] Among the 493 infants who completed the vaccine series, we estimate that 174 cases of chronic HBV infection would have occurred had they not been vaccinated. We expect that vaccination prevented 160 (92%) cases.

Discussion

This is the first report of a large surveillance system and vaccination program for hepatitis B–infected pregnant women and their newborns in the continental United States.

A primary aim of the program is to assist in delivery of the second and third dose of HB vaccine. Although the second dose of vaccine was administered to 89% of the infants enrolled in the program, only 67% received the third vaccine dose. A similar decline was noted among Asian and Pacific Island women who received county medical services in California.[13] In the New York City program, as in the California study, most infants without a documented third dose of vaccine were lost to follow-up. Because some of these infants may have completed the vaccine series elsewhere, the overall completion rate of 59% is likely to be an underestimate. However, many infants lost to follow-up had been receiving care at public clinics and hospitals and would have been unlikely to complete the series at private sites.

Method of health care payment explained most of the differences in vaccine completion rates. Medicaid-insured infants and uninsured Black and Hispanic infants had very low vaccine completion rates. Medicaid reimbursement in New York State falls 60 cents short of vaccine cost, does not adequately cover the cost of vaccine administration, and requires months for release of funds—all barriers to physicians caring for infants requiring HB vaccination. Improvement of vaccine completion will require increased Medicaid reimbursement.

The racial differences noted among uninsured mothers probably reflect socioeconomic differences. More than 95% of the uninsured Asian and White mothers gave birth at private hospitals; these women may be in a higher socioeconomic group than the uninsured Black and Hispanic mothers, most of whom delivered in public hospitals. Intensive follow-up and ready access to free vaccine may improve coverage rates for infants born in public hospitals. Additional strategies to improve completion rates include providing documentation of HB vaccine on the immunization card and incorporating HB vaccine into routine childhood vaccination schedules. HB vaccine coverage rates as high as 75% to 95% have been achieved when HB vaccine is administered with other childhood vaccines.[14–17]

In 1988, the Immunization Practices Advisory Committee recommended universal screening of all pregnant women for HBsAg.[12] In response, New York State passed a law, which took effect in May 1990, mandating universal screening of all pregnant women.[18] Future directions for the program include (1) administration of the second and third dose of HB vaccine at 2 and 6 months of age, concomitant with the diphtheria-tetanus-pertussis vaccine, for those vaccinated at city clinics; (2) HB surface antibody testing at 12 months; and

(3) provision of HBsAg screening and HB vaccine to family contacts of HBsAg-positive pregnant women.

The NYCDOH program was designed to establish surveillance in hospitals that serve women at highest risk for hepatitis B carriage. Therefore, the findings reported here do not reflect all HBsAg carrier mothers in New York City. However, we believe these findings may apply to other large, diverse cities in the United States. Health departments can assist physicians and patients by coordinating the transfer of information between physician groups, providing education to HBsAg-positive women, and ensuring follow-up of infants, particularly those in hard-to-reach groups. □

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