

Hepatitis B vaccination of newborn infants in rural China: evaluation of a village-based, out-of-cold-chain delivery strategy

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Objective To prevent perinatal transmission of hepatitis B virus (HBV), WHO recommends that the first dose of hepatitis B (HepB) vaccine be given within 24 hours after birth. This presents a challenge in remote areas with limited cold-chain infrastructure and where many children are born at home.

Methods Rural townships in three counties in China's Hunan Province were randomized into three groups with different strategies for delivery of the first dose of HepB vaccine. In group 1, vaccine was stored within the cold chain and administered in township hospitals. In group 2, vaccine was stored out of the cold chain in villages and administered by village-based health workers to infants at home. Group 3 used the same strategy as group 2, but vaccine was packaged in a prefilled injection device. Training of immunization providers and public communication conveying the importance of the birth dose was performed for all groups.

Findings Among children born at home, timely administration (within 24 hours after birth) of the first dose of HepB vaccine increased in all groups after the study: group 1, from 2.4% to 25.2%; group 2, from 2.6% to 51.8%; and group 3, from 0.6% to 66.7%; $P < 0.001$ in each case. No significant difference in antibody response to vaccine was observed between the groups.

Conclusion Timely administration of the first dose of HepB vaccine was improved by communication and training activities, and by out-of-cold-chain storage of vaccine and administration at the village level, especially among children born at home.

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Une traduction en français de ce résumé figure à la fin de l'article. Al final del artículo se facilita una traducción al español. الترجمة العربية لهذه الخلاصة في نهاية النص الكامل لهذه المقالة.

Introduction

Globally, chronic cirrhosis and liver cancer caused by infection with hepatitis B virus (HBV) cause 600 000 deaths annually.¹ Perinatal transmission (from mother to infant at birth) is a major route of transmission of HBV in areas such as Asia, where persistent infections are highly endemic (prevalence of hepatitis B surface antigen [HBsAg], > 8%) and the prevalence of hepatitis B e antigen (HBeAg, a serological marker that correlates with an increased risk of transmission) is high among chronically infected mothers.^{1–3} Vaccination against HBV is approximately 90% effective in preventing perinatal transmission when the first dose ("birth dose") of vaccine is given within 24 hours after birth.² WHO recommends this practice in countries with substantial perinatal transmission.²

Giving hepatitis B (HepB) vaccine within 24 hours after birth to infants born in remote areas, especially to those born at home, can be difficult logistically owing to the lack of cold-chain infrastructure. Although China recommends that the first dose of HepB vaccine be given at birth, followed by the second and third doses at age 1 and 6 months, the timely administration (within 24 hours after birth) of the birth dose is low. Results from a nationwide survey carried out in 1999 showed that among children who had received a first dose of HepB vaccine, only 39% received it within 24 hours after birth.⁴ Among children born at home – who represent at least 17% of the birth cohort, or 2.3 million children annually – timely administration among those who had received a first dose was even lower (17%).^{4,5} A national serological survey in

2002 showed that HBsAg prevalence was 5% among children overall and was especially high among children in rural areas (8%).⁶

As a strategy to improve coverage of the HepB vaccine birth dose, WHO recommends the use of vaccine vial monitors (VVMs) – heat-sensitive labels that change colour with cumulative exposure to excessive heat – in combination with proper training of vaccine providers; HepB vaccine can be stored without refrigeration when labelled with VVMs.^{7,8} HepB vaccine maintains its potency for 1–3 months at temperatures up to 37 °C and can be safely stored outside the cold chain in tropical climates.^{9–12} Indonesia has successfully introduced an out-of-cold-chain strategy for delivery of the HepB vaccine birth dose nationwide, storing vaccine in the homes of village midwives to make the

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vaccine more readily available for home births.¹² Although the strategy is highly promising, its departure from standard cold-chain practices and concerns about the logistics of home-based immunization have limited its introduction in other countries.¹³

Our study explored the feasibility and effectiveness of a village-based, out-of-cold-chain strategy for improving timely administration of the HepB vaccine birth dose in rural areas of Hunan Province, China. We further explored the use of a prefilled injection device (Uniject) to administer HepB vaccine in villages outside the cold chain.

Methods

HepB vaccine

The recombinant HepB vaccine used in the study was produced by Beijing Tiantan Biological Products, Beijing, and was supplied either in single-dose ampoules or in Uniject devices, both of which were filled in China. All vaccine was provided with VVMs attached either to the ampoule or to the Uniject packaging. The study design allowed vaccines to be kept outside the cold chain until the VVM indicated that they should be discarded, but for a maximum duration of 1 month.

Injection devices

In the study areas, either auto-disable syringes or Uniject devices were used to administer vaccine. Uniject is a prefilled, single-dose injection device developed by the Program for Appropriate Technology in Health (PATH) and licensed to Becton & Dickinson for commercial production and distribution. The device is compact, self-contained and non-reusable, comprising a hypodermic needle attached to a small plastic blister prefilled with a single dose of vaccine.

Study sites and dates

The study was carried out in Hunan Province between September 2003 and September 2004. Within the province, three counties – Sangzhi, Longshan and Fenghuang – were chosen based on high proportions (40–60%) of out-of-hospital births. In all three counties, as in the rest of China, HepB vaccination is recommended for all children from birth. Within the three counties, all townships situated at least 20 km from the county capital (81 of 116 townships in the county) were chosen to participate in the study. The participating town-

ships included 957 villages, with a total population of about 800 000.

Study participants

During the study period, 6988 infants were born in the three study groups. In the baseline coverage survey, there were 1202 infants, with 42.4% born at home. In the follow-up coverage survey, there were also 1202 infants, 38.5% born at home. In the serological survey, there were 606 infants.

Study procedures

Rural townships (those lying more than 20 km from the county capital) in the participating counties were randomly divided into three groups:

- Group 1 (ampoule inside the cold chain): HepB vaccine used was provided in ampoules, stored within the cold chain and administered using auto-disable syringes to infants in township hospitals. HepB vaccination practices in these townships differed from pre-study practices only in that there was additional awareness-raising about the importance of vaccination. Parents of children born outside the hospital were requested by village doctors to bring their children to the hospital as soon after birth as possible for the first dose of HepB vaccine;
- Group 2 (ampoule outside the cold chain): HepB vaccine was provided in ampoules, stored out of the cold chain in villages, and administered using auto-disable syringes by village-based health workers to infants in their homes;
- Group 3 (HepB-Uniject outside the cold chain): HepB vaccine was provided in Uniject devices, stored out of the cold chain in villages and administered by village-based health workers to infants in their homes.

In groups 2 and 3, infants born in the hospital received the birth dose at the hospital using vaccine stored in the cold chain, and infants born at home received vaccine stored outside the cold chain at ambient temperature at the provider's home or clinic in a box protected from direct sunlight, freezing, extreme heat sources and tampering. In all groups, the second and third doses of HepB vaccine were stored and delivered according to group assignment, i.e. inside the cold chain (group 1) or outside the cold chain (groups 2 and 3).

Raising awareness

At the beginning of the study, investigators met with public health officials at all levels, including township health-care workers, village doctors and midwives. In addition, residents of all three counties were informed of the study by a variety of means, including public service announcements in print and broadcast media. Information provided included an explanation of the importance of HepB immunization and of the birth dose.

Temperature monitoring

In each study group within each county, one immunization clinic was randomly selected to monitor vaccine temperature. Gemini TinyTalk Data Loggers, which are electronic temperature-data recorders, were stored with the study vaccines to monitor storage temperatures.

Evaluation of impact

Two surveys were conducted, one before study implementation (the "baseline coverage survey") and one after (the "follow-up coverage survey"), to evaluate the impact of the interventions on timely administration of the birth dose of HB vaccine. For both surveys, a modification of the WHO immunization cluster survey was used.¹⁴ In each of the three study groups, 40 villages (clusters) were randomly chosen with probability proportional to size. At each selected village, the survey team started at the village centre and continued in a randomly chosen direction until it had identified and interviewed the parents of at least 10 children aged 9–20 months for the baseline survey and aged 1–11 months for the follow-up survey (which focused on birth dose and was conducted immediately after the intervention). Interviewers enquired about receipt of immunizations and reasons for any delay in receiving the birth dose of HepB vaccine. Interviewers also reviewed immunization cards kept by parents and immunization records at the offices of village and township health workers.

Evaluation of immunological response

In a separate survey to compare antibody responses to the vaccine (the serological survey), approximately 200 children from each group (12.8%, 11.4% and 10.7% of the total number of children vaccinated during the study in groups

Table 1. Improvements in timely delivery of the hepatitis B vaccine at birth, by study group, Hunan, China

Group	Baseline survey			Follow-up survey		
	No. of participants	Percentage that received first dose (95% CI)	Percentage that received first dose within 24 hours of birth (95% CI)	No. of participants	Percentage that received first dose (95% CI)	Percentage that received first dose within 24 hours of birth (95% CI)
Group 1 (ampoule inside the cold chain)	401	83.0 (75.1–91.0)	8.0 (4.7–11.2)	401	98.8 (96.9–100)	57.9 (50.3–65.4)
Group 2 (ampoule outside the cold chain)	391	84.1 (76.9–91.4)	11.3 (7.3–15.2)	401	98.8 (97.2–99.8)	67.8 ^a (61.5–74.2)
Group 3 (HB-Uniject outside the cold chain)	410	88.8 (84.4–93.1)	6.8 (4.1–5.9)	400	99.8 (99.3–100)	77.3 ^b (71.5–83.0)
Total	1202	85.4	8.7	1202	98.9	67.6

CI, confidence interval.

^a For follow-up survey, $P < 0.05$ for difference between group 2 and group 1.

^b For follow-up survey, $P < 0.0001$ for difference between group 3 and group 1; $P < 0.05$ for difference between group 3 and group 2.

1, 2 and 3, respectively) were selected at random at the end of the study to give blood specimens. Eligibility was restricted to children aged 7–11 months who had received all three doses of the HB vaccine including a birth dose (defined as a dose administered within 24 hours of birth) and who had received the last dose at least a month before the survey.

All serum specimens were tested by radioimmunoassay (provided by the Bei Fang Biological Technical Institute, Beijing) at the National Vaccine and Serum Institute (NVSI) for HBsAg, antibody to HBsAg (anti-HBs), and antibody to HBV core antigen (anti-HBc). For samples with undetectable titres, a value of 2.0 mIU/ml (the lower limit of detection of the assay) was assigned when calculating the geometric mean titre. The anti-HBs titres were estimated by serial dilution.

Statistical methods

For all analyses, timely receipt of the birth dose was defined as receipt of the first dose of HB vaccine within 24 hours of birth. The baseline and follow-up surveys were analysed with CSAMPLE (US Centers for Disease Control and Prevention) and SUDAAN (RTI International, Research Triangle Park, North Carolina, USA), which take into account the clustered sampling used in these surveys. Proportions were compared by the chi-squared test as implemented

in SUDAAN. All other analyses were performed with SAS (RTI International, Research Triangle Park, North Carolina, USA). The baseline and follow-up surveys were powered to be likely to detect an improvement of 15% in birth-dose coverage if the coverage were 75% in the non-intervention group, assuming a design effect of 1.5. The serological survey was powered to detect a decline of 10% in the seroprotection rate if the baseline rate were 95%.

Study monitoring and ethical review

The study was carried out by NVSI and the Hunan Provincial Center for Disease Control and Prevention with funding from PATH and technical assistance from PATH and the Centers for Disease Control and Prevention (CDC). Ethical review committees at NVSI, PATH, and CDC reviewed and approved the protocol before the start of the study. All families of the infants included gave written informed consent to participate in the study.

Results

Timely administration of birth dose

Coverage of the birth dose of HepB vaccine administered on time increased in all three groups: from 8.0% to 57.9% in group 1 (ampoule inside the cold chain), from 11.3% to 67.8% in group 2 (ampoule outside the cold chain),

and from 6.8% to 77.3% in group 3 (HepB-Uniject outside the cold chain), with $P < 0.05$ for differences between each of the groups ($P = 0.043$ for group 1 versus group 2, $P = 0.042$ for group 2 versus group 3, $P < 0.001$ for group 1 versus group 3) (Table 1).

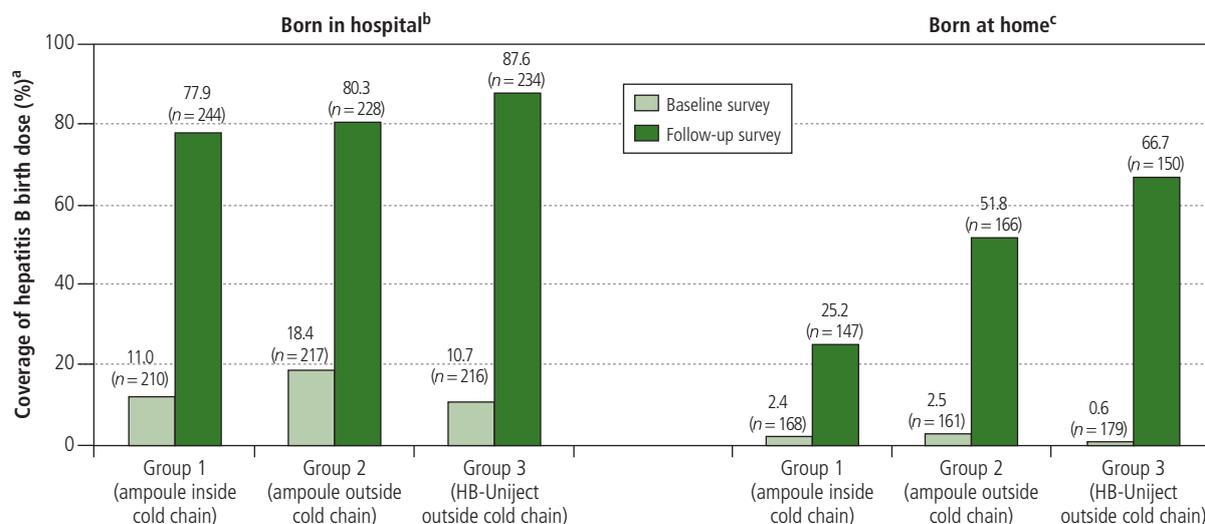
Among infants born in a hospital, birth-dose vaccine coverage increased from 13.4% (95% confidence interval, CI, 10.4–16.4%) to 81.9% (95% CI, 78.3–85.5%; Fig. 1). Birth-dose coverage was higher in group 3 (87.6%; 95% CI, 82.0–93.2%) than in group 1 (77.9%; 95% CI, 71.4–84.3%) but group 2 (80.3%; 95% CI, 74.9–85.7%) was not significantly different from the other two groups (Fig. 1).

Among infants born at home, birth-dose coverage also increased in all three groups, especially in the out-of-cold-chain groups. Birth-dose coverage was higher in group 2 (51.8%; 95% CI, 40.9–62.7%) and group 3 (66.7%; 95% CI, 56.9–76.5%) than in group 1 (25.2%; 95% CI, 14.6–35.7%; $P < 0.001$ for both comparisons; Fig. 1).

For infants born at home among all groups, birth-dose coverage was higher for those vaccinated at home than those who were taken by parents to township hospitals for vaccination (73.5% versus 32.8%; $P < 0.001$).

A sample of parents was asked why their children had not been vaccinated within 24 hours after birth. Before the study, 78% of parents said the main

Fig. 1. Proportion of children who received the first dose of hepatitis B vaccine within 24 hours of birth at home or in hospital, by study group, Hunan, China



^a Proportion of all infants who received the first dose of hepatitis B vaccine within 24 hours after birth.

^b For follow-up survey, $P < 0.05$ for group 3 versus group 1.

^c For follow-up survey, $P < 0.001$ for group 2 or group 3 versus group 1.

reason was that they had not been informed by a health-care provider about the importance of receiving HepB vaccine within 24 hours after birth. After the study, the proportion giving this response decreased to 41% (Table 2). For children born at home, the second most common reason was “residence too far from the immunization clinics” (11% before the study and 19% after the study).

Results of the serological survey

Of the 606 children in the serological survey, all of whom had received three doses of HepB vaccine including a birth dose, 580 (96%) had detectable levels of anti-HBs and 89% had levels of ≥ 10 mIU/ml (“protective levels”). There were no significant differences between groups in the proportion of infants with seroprotective levels (group 1, 89%; group 2, 91%; group 3, 89%) or in the geometric mean titres of anti-HBs (group 1, 95.5 mIU/ml; group 2, 93.3 mIU/ml; group 3, 102.3 mIU/ml). Of all children in the serological survey, 5 (0.8%) were HBsAg-positive and anti-HBc positive (group 1, 0.5%; group 2, 0.5%; group 3, 1.5%; $P = 0.43$ for differences between groups).

Monitoring vaccine storage and adverse events

Two of the three township refrigerators monitored in the group 1 sites showed

temperatures of less than 0 °C. In one refrigerator, the temperature was less than 0 °C for about 4 months. Upon leaving the township hospital, vaccine in townships in groups 2 and 3 was exposed to temperatures ranging from 2 °C to 30 °C, with an average out-of-cold-chain storage temperature of 16 °C. Of 15 000 doses distributed outside the cold chain, 50 doses from different villages in groups 2 and 3 had to be discarded owing to VVM colour changes indicative of excessive heat exposure.

Serious adverse events following administration of HepB vaccine were monitored using China’s routine passive monitoring system; none were reported during the study.

Discussion

The high risk of transmission of HBV from an infected mother to her newborn infant and the serious long-term consequences of perinatal HBV infection (e.g. cirrhosis or liver cancer) make prevention of transmission through immunization at birth particularly important.¹⁵ In remote areas in China and other countries where many children are born at home, timely (within 24 hours) administration of HepB vaccine has been difficult to achieve using routine methods of immunization delivery. This study showed that timely administration of the first dose of HepB vaccine to

newborns can be substantially improved through public awareness efforts and provider training and, especially for infants born at home, through storage of vaccine in villages outside the cold chain and administration of vaccine by village health workers.

Expanding the role of existing village-based health workers is an effective way to improve access to immunization for hard-to-reach populations. While the trend in China has been towards encouraging births and HepB birth-dose immunization in hospitals, this study validated an alternate strategy for areas where it is not feasible for women to give birth in hospitals. For infants born at home, home-based immunization by village health workers resulted in substantially higher rates of timely administration of the first HepB vaccine dose compared with immunization at township hospitals. Storing the vaccine out of the cold chain in the village health workers’ homes or clinics is a simple and feasible approach to enable village-based immunization in areas where refrigeration is not reliable. In addition, according to local custom in some minority areas, newborn infants cannot be taken out of the home during the first month after birth. At-home immunization is the only way to deliver the first HepB vaccine dose on time among these populations. This study confirmed the findings of other studies in Viet Nam, Indonesia

Table 2. Reasons given by parents for late administration of hepatitis B vaccine at birth to children born at home or in hospital, Hunan, China

Reasons for late birth dose	Children born at home (%)		Children born in hospital (%)	
	Before study (n = 378)	After study (n = 235)	Before study (n = 506)	After study (n = 122)
Not informed by provider about the importance of receiving hepatitis B vaccine within 24 hours after birth	298 (78.8)	114 (48.5)	392 (77.5)	32 (26.2)
Residence was too far from the immunization clinic	42 (11.1)	44 (18.7)	14 (2.8)	4 (3.3)
Infant had "low birth weight"	–	4 (1.7)	–	29 (23.8)
Did not want the newborn infant vaccinated	15 (4.0)	22 (9.4)	21 (4.2)	2 (1.6)
Vaccine not available at immunization clinic	15 (4.0)	4 (1.7)	23 (4.5)	6 (4.9)
Considered vaccine to be too expensive	4 (1.1)	1 (0.4)	7 (1.4)	1 (0.8)
Other	13 (3.4)	46 (19.6)	49 (9.7)	48 (39.3)

and China that have shown that HepB vaccine is stable when used outside the cold chain.^{7,8,16}

The most common concerns about taking vaccines out of the cold chain and hospital infrastructure – temperature exposure and injection safety – were not found to be problems in this study. In fact, the results of temperature monitoring show that storing vaccine within the cold chain may be problematic if, as observed here, the vaccine is subjected to freezing in cold-chain refrigerators. Although HepB vaccine is relatively heat-tolerant, it dissociates from its adjuvant and may lose immunogenicity if frozen.¹⁷ Several studies in other countries have shown that vaccines are often exposed to freezing temperatures in the cold chain.^{18–20} Taking vaccine out of the cold chain could potentially decrease the risk of vaccine damage caused by inadvertent freezing. However, in cold climates, vaccines stored out of the cold chain would need to be protected from freezing during winter months, and a repeat study in a cold climate may be warranted to evaluate the risks of vaccine freezing outside the cold chain.

Even among infants born in areas where vaccine was not stored outside the cold chain (group 1), timely administration of HepB vaccine increased substantially for infants born at home and for those born in hospitals, despite the absence of interventions other than raising awareness through provider training and supervision. This finding underscores the importance of ongoing monitoring and programme support in optimizing the results of new programmes such as the introduction of the HepB vaccine birth dose. The follow-up coverage survey revealed that some health workers were reluctant to give the vaccine birth dose to infants perceived to be sick, weak or of low birth weight, further underscoring the need for monitoring of hospital staff to ensure that all infants born in hospitals receive the HepB vaccine birth dose on time.

This village-based, out-of-cold-chain strategy is relevant to the global reduction of HBV infection, since WHO estimates that more than 50% of the world's children are born at home.¹ This strategy could be applied in many countries where health workers live among

populations that are not accessible by the formal health system. It could be beneficial not only in geographically isolated areas, but also in urban areas where cultural differences impede access to clinic-based immunizations. ■

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Competing interests: None declared.

Résumé

Vaccination contre l'hépatite B des nouveau-nés en milieu rural en Chine : évaluation d'une stratégie de délivrance du vaccin au niveau des villages, en dehors de la chaîne du froid

Objectif Pour prévenir la transmission périnatale du virus de l'hépatite B (VHB), l'OMS recommande que la première dose de vaccin contre l'hépatite B (HepB) soit administrée dans les 24 h suivant la naissance. Cela représente un défi pour les zones reculées et peu équipées en infrastructures de maintien de la chaîne du froid, dans lesquelles de nombreux enfants naissent à la maison.

Méthodes Des localités rurales appartenant à trois comtés de la

province chinoise du Hunan ont été réparties au hasard entre trois groupes bénéficiant de stratégies différentes pour la délivrance de la première dose de vaccin anti-HepB. Dans le cas du groupe 1, le vaccin a été stocké dans le cadre de la chaîne du froid et administré dans des hôpitaux relevant des localités. Dans celui du groupe 2, le vaccin a été stocké en dehors de la chaîne du froid dans des villages et administré à domicile aux nourrissons

par des agents de santé basés dans ces villages. Pour le groupe 3, la même stratégie a été appliquée que pour le groupe 2, sauf que le vaccin a été conditionné dans un dispositif pour injection pré-rempli. Pour tous les groupes, une formation a été apportée aux vaccinateurs et une opération de communication en direction du public a été menée pour faire connaître l'importance de la vaccination à la naissance.

Résultats A l'issue de l'étude, l'administration dans les délais (dans les 24 h suivant la naissance) de la première dose de vaccin anti-HepB a augmenté chez les enfants nés à domicile de tous

les groupes. Groupe 1 : 2,4 % à 25,2 % ; groupe 2 : 2,6 % à 51,8 % et groupe 3 : 0,6 % à 66,7 % ; ($P < 0,001$ dans tous les cas). Aucune différence notable n'a été relevée entre les groupes concernant la réponse en anticorps au vaccin.

Conclusion Les opérations de communication et de formation, ainsi que le stockage hors de la chaîne du froid du vaccin et son administration au niveau des villages, ont entraîné des améliorations en termes d'administration dans les délais de la première dose de vaccin anti-HepB, en particulier chez les enfants nés à domicile.

Resumen

Vacunación de recién nacidos contra la hepatitis B en la China rural: evaluación de una estrategia de implementación sin cadena de frío basada en las aldeas

Objetivo A fin de prevenir la transmisión perinatal del virus de la hepatitis B, la OMS recomienda que la primera dosis de la vacuna contra esa enfermedad (HepB) se administre en un plazo de 24 horas después del nacimiento. Eso entraña serias dificultades en las zonas remotas, donde falta infraestructura de cadena de frío y donde muchos niños nacen en el hogar.

Métodos Se procedió a asignar aleatoriamente diversos municipios rurales de tres cantones de la provincia china de Hunan a tres estrategias diferentes de implementación de la primera dosis de vacuna HepB. En el grupo 1 la vacuna se conservó en la cadena de frío y se administró en los hospitales del municipio. En el grupo 2 la vacuna se conservó fuera de la cadena de frío en las aldeas y fue administrada por los agentes de salud de aldea a los lactantes en su hogar. Con el grupo 3 se usó la misma estrategia que con el grupo 2, pero envasando la vacuna en un dispositivo de inyección

precargado. En todos los grupos se adiestró oportunamente a los vacunadores y se hizo llegar a la población el mensaje de que la dosis de nacimiento era muy importante.

Resultados Entre los niños nacidos en el hogar, la administración puntual (en las 24 horas siguientes al nacimiento) de la primera dosis de vacuna HepB aumentó en todos los grupos después del estudio: del 2,4% al 25,2% en el grupo 1; del 2,6% al 51,8% en el grupo 2; y del 0,6% al 66,7% en el grupo 3 ($P < 0,001$ en todos los casos). No se observó ninguna diferencia importante en la respuesta de anticuerpos inducida por la vacuna entre los tres grupos.

Conclusión La administración puntual de la primera dosis de la vacuna HepB mejoró de resultados de las actividades de comunicación y capacitación, así como del procedimiento de conservar la vacuna fuera de la cadena de frío y administrarla en las aldeas, especialmente entre los niños nacidos en el hogar.

ملخص

تطعيم الولدان بلقاح التهاب الكبد البائي في أرياف الصين:

تقييم لاستراتيجية تستند على القرية والتوصيل بدون سلسلة تبريد

وفي جميع المجموعات، تدرب العاملون في التلقيح وفي إيصال المعلومات لتوضيح أهمية الجرعة التي تُعطى من اللقاح عند الولادة.

الموجودات: من بين الأطفال الذين ولدوا في منازلهم، زاد معدل إعطاء الجرعة الأولى من لقاح التهاب الكبد البائي في الوقت المناسب (خلال 24 ساعة من الولادة) في جميع مجموعات الدراسة، فقد زاد في المجموعة الأولى من 2.4% إلى 25.2%، وفي المجموعة الثانية من 2.6% إلى 51.8% وفي المجموعة الثالثة من 0.6% إلى 66.7%، وبقوة احتمال تقل عن 0.001 في كل حالة. ولم يلاحظ فرق يُعتدُّ به إحصائياً في الاستجابة الضدية للقاح بين هذه المجموعات.

الاستنتاج: إن إعطاء الجرعة الأولى من لقاح التهاب الكبد البائي في الوقت المناسب قد تحسن بإدخال أنشطة للتدريب والتواصل وبتخزين اللقاح خارج سلسلة التبريد وإعطائه على مستوى القرية.

الهدف: توصي منظمة الصحة العالمية بإعطاء الجرعة الأولى من لقاح التهاب الكبد البائي خلال 24 ساعة من الولادة لتقليل انتقال فيروس التهاب الكبد في الفترة المحيطة بالولادة؛ وهذا ما يعتبر تحدياً في المناطق البعيدة التي تقل فيها البنية الأساسية لسلسلة التبريد، والتي يولد فيها عدد كبير من الأطفال.

الطريقة: قُسمت البلدان الريفية في ثلاث مقاطعات من ولاية هونان الصينية عشوائياً إلى ثلاث مجموعات تطبق فيها استراتيجيات مختلفة لإعطاء الجرعة الأولى من لقاح التهاب الكبد البائي. وفي المجموعة الأولى اختزن اللقاح في سلسلة التبريد وأعطى في مستشفيات البلدات وفي المجموعة الثانية اختزن اللقاح خارج سلسلة التبريد في القرى وأعطى من قِبَل العاملين الصحيين القرويين للرُضَع في منازلهم. أما في المجموعة الثالثة فقد نُفذت الاستراتيجية المتبعة في المجموعة الثانية مع تعليب اللقاح في أدوات مملوءة مسبقاً للحقن.

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