

## Review

## Factors associated with incomplete vaccination of babies at risk of perinatal hepatitis B transmission: A London study in 2006

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## ABSTRACT

We measured the hepatitis B (HB) vaccination uptake in 249 London babies born in 2004 to HBsAg positive mothers. Two thirds (69%) received three vaccinations and half (49%, 95% CI 43–56) received a complete course (four doses). Complete immunization was associated with sector of delivery ( $p < 0.001$ ), recording of the GP details in case notes, having booked for antenatal care, having a good command of English, and receipt of written information on HB. A third of the babies (33%) had a post-vaccination test; when the mother had other children, 39% of the oldest children were vaccinated; information on partner's vaccination was available for 12%. This study highlights that appropriate counseling and information should be provided to the mothers, and the importance in London of arrangements for integrated care across acute and primary care services.

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### 1. Introduction

The risk of neonatal hepatitis B virus (HBV) infection acquired through mother to child transmission is between 70 and 90% when a mother is of high infectivity (HBsAg positive and anti HBe negative). Babies born to HBsAg positive mothers in the absence of HBeAg can also be infected [1,2]. About 85% of infections in newborns become

chronic [3,4]. Among infected babies, the risk of cirrhosis or primary hepatocellular carcinoma is around 15–25% [1,5].

Since 1998 in the UK, the antenatal screening programme has included universal offer of HBsAg testing in order to ensure that women receive appropriate treatment; their babies receive a full course of vaccination to prevent perinatal or early childhood infection; and their family contacts are screened and vaccinated to prevent horizontal transmission [6,7]. The accelerated schedule comprises four doses, given at birth, 1, 2 and 12 months; babies born to high-risk women are also given 200 i.u. of HB Immunoglobulin (HBIG) at birth; infants are tested at around 1 year to identify those with chronic infection [8].

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In London an estimated 98% of pregnant women are tested for HBsAg and there are an estimated 1200 infants per year at risk [9–10]. There are various mechanisms in maternity units and Primary Care Trusts (PCTs) for the provision and recording of vaccination [11]. Local audits have shown that vaccination uptake ranged from less than 20 to 90% [12–13]. The HPA Cover of Vaccination Evaluated Rapidly (COVER) scheme monitors the coverage of HB vaccination through data submissions from the PCTs [14] but the completeness and quality of this information is unclear. No detailed London wide study of the characteristics of those at risk, completeness of vaccine coverage and factors associated with completion of vaccination has been carried out. This paper describes a cohort of HBsAg positive mothers and their babies, uptake of HB vaccination by 1 year of age and factors associated with incomplete uptake. Implications for policy and practice in London are discussed.

## 2. Materials and methods

We conducted a retrospective cohort study of London resident HBsAg positive mothers, who delivered a live baby in a London NHS Trust maternity unit in the fourth quarter of 2004, and their babies. Cases were identified through maternity units' and laboratories' records.

A questionnaire was filled in for each mother by the Antenatal Screening Coordinators (ASC) which included age, ethnicity, place of birth, occupation, residence, command of English; history of drug use, imprisonment and homelessness (or vulnerable housed, e.g. in a hostel, or in other supported accommodation) in the past year; HB serostatus (HBsAg, HBeAg, anti-HBe); whether the mother had booked for antenatal care, had received a patient information leaflet on hepatitis B infection and vaccination (and if so, the date when this was provided to her); whether she was referred to a hepatologist; whether the details of general practitioners (GPs) were recorded in case notes; and whether the child received immunization (vaccination +/- HBIg) at birth.

After the babies were at least 15 months old, staff at the local Health Protection Agency (HPA) Health Protection Unit (HPU) completed a follow up questionnaire. Using HPU records, supplemented where needed by GPs, hospital pediatricians and PCT records, they documented the number of vaccines received, whether a post-vaccination test was done and its result as well as the screening and immunization status of the partner of the mother and of the child's siblings.

The main outcome measures were the proportion of babies who received three doses or four doses of HB vaccine (complete vaccination). Secondary outcomes were the proportion having a post-vaccination test and its results, and the proportion of family contacts screened and vaccinated.

The strength of associations was measured using odd ratios and chi square test of association. We used STATA version 8.2. Those variables with a *p*-value of less than 0.2 in the single variable analyses were included in the multivariable analysis. Owing to up to 50% missing data for some variables, we verified the absence of association between these and predictive variables. When assured they could not confound the associations, they were excluded from the multivariable analysis. We presented factors associated with an incomplete vaccination and conducted a sensitivity analysis with a) a threshold of three vaccines (as there is strong evidence that protective immunity can be achieved with the primary course of three [15], and b) exclusion of babies reported to be lost to follow up (i.e. no records held by the HPU, the GP or the PCT, or family known to have moved out of London) because of the potential for misclassification of the outcome.

## 3. Results

Of 269 women initially identified at 29 NHS maternity units, 20 were excluded: four had a stillbirth; one delivered in September 2004; five were out of London residents; three were identified by the name of the baby only but no other data could be reported; four were duplicate reports, three were not HBsAg+ but were initially included because their baby received vaccination due to family circumstances (e.g. partner of the mother was HBsAg+, child in fostering, mother declining the HB antenatal test).

### 3.1. Characteristics of the mothers

The median age at delivery was 29 years (range 16–47). More than half of the mothers (96/181 where information known, 53%; 95% CI 45–60) were born in Africa, mostly in Ghana (31), Nigeria (20), Somalia (17) and Sierra Leone (6). Mothers born in Eastern Europe (22, 12%) were mostly from Albania (5), Kosovo (4) and Romania (3). Other well-represented countries were Bangladesh (6), Turkey (5) and Afghanistan (5). More than a third of the mothers (35%) had a basic or less than basic command of English. The large majority (209/217 where information known, 96%; 95% CI 93–98) had received antenatal care in the Trust where they delivered. At least 7/209 booked for antenatal care after 30 weeks of pregnancy. Few mothers (18/246, 7%; 95% CI 4–11) were resident in a health sector (i.e. HPU) different to the HPU where they delivered. Twenty-eight were HBeAg positive (13%; 95% CI 9–19) and six had an acute HB infection (3%; 95% CI 1–7). Where information was available, less than 2% had recent history of drug use, imprisonment or homelessness. Less than half overall, and a third of those HBeAg positive were reportedly referred to a hepatologist [Table 1].

### 3.2. Vaccination

Overall, 20/28 eligible babies received HBIg. A further eight, who were not eligible according to the available information, also received HBIg. Of all those who received HBIg, 26 (93%) had it on the day of birth. Overall, 21/28 (68%) of babies born to HBeAg positive mothers received four vaccinations.

Almost all babies (241/249, 97%) reportedly received HB vaccination at birth, on the day of birth for 178/219 babies (81%) where dates were known, and on the second day for 39 (18%).

Overall, 172/249 babies (69%) received three doses of vaccine with 123/249 (49%; 95% CI 43–56) reportedly receiving four doses. Of the remaining babies, 15 (6%) received two doses, 57 (23%) had only the birth dose and 5 (2%) had no vaccination documented. Coverage varied across the London sectors [Fig. 1].

In single variable analyses, factors positively associated with receiving the full course of vaccine included delivering in the South East sector, having booked for antenatal care, receiving written information on hepatitis B at the maternity unit; having a good

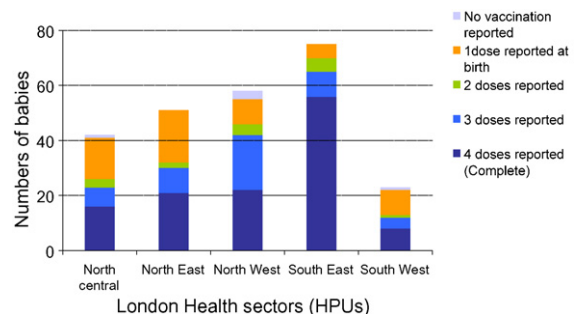


Fig. 1. Number of babies, by vaccine doses received, and by sector.

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