# Antenatal Hepatitis B screening in pregnancy: Prevention of mother-to-child transmission strategy in Kedah, Malaysia

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## ABSTRACT

**Introduction: Hepatitis B virus remains a major global public health concern, with mother-to-child transmission contributing substantially to chronic infection, cirrhosis and hepatocellular carcinoma. In 2019, the Ministry of Health Malaysia initiated pilot universal antenatal hepatitis B screening in four selected states, namely Kedah, Pahang, Terengganu and Sabah, to strengthen prevention of mother-to-child transmission (PMTCT). This study reviewed the implementation of the PMTCT hepatitis B pilot project in Kedah by evaluating the transmission rate of HBV to infants, antenatal screening coverage of HBV and the prevalence of hepatitis B among pregnant mothers.**

**Materials and Methods: A cross-sectional review of secondary data was conducted using programme registers from 17 participating health clinics in Kedah. Data were extracted and analysed. The key outcomes were antenatal screening coverage, maternal HBsAg prevalence and mother-to-child transmission rate.**

**Results: A total of 54,682 antenatal attendees were screened for HBV during the study period, giving an overall screening coverage of 95.8%. Maternal HBsAg prevalence was 0.16%, with 92 confirmed HBsAg-positive mothers. Of these, 91 were referred for further assessment and 83 received antiviral therapy during pregnancy. Among exposed infants with documented follow-up, no HBsAg-positive cases were detected, resulting in a mother-to-child transmission rate of 0%.**

**Conclusion: Overall, the mother-to-child transmission rate of the pilot project in Kedah was satisfactory at 0% among antenatal mothers who were treated and completed the follow-up plan. In addition, the prevalence of HBV among antenatal mothers was relatively low at 0.16%, with high HBV screening coverage of 95.8% among antenatal attendees.**

**KEYWORDS:**
*Hepatitis B; mother-to-child transmission; antenatal screening; prevention cascade; Malaysia*

## INTRODUCTION

Hepatitis B virus (HBV) remains a formidable global health challenge, with an estimated 240 million people living with chronic infection and over 780,000 deaths occurring annually from related complications such as cirrhosis and liver cancer.[1] Mother-to-child transmission (MTCT) is one of the primary modes of transmission, accounting for 30–50% of all chronic cases worldwide.[2] The risk of an infant acquiring chronic infection is exceptionally high, ranging from 70% to 90% if the mother is positive for both Hepatitis B surface antigen (HBsAg) and hepatitis B e-antigen (HBeAg), and between 10% and 40% for infants born to HBeAg-negative mothers.[2] In response, the World Health Organization (WHO) has established clear recommendations for preventing vertical transmission.[3] These include the universal administration of the Hepatitis B vaccine birth dose within 24 hours of delivery, completion of the full vaccine series, and the use of Hepatitis B immunoglobulin (HBIG) for infants born to highly infectious mothers.[3] These interventions are cornerstones of the WHO global strategy to reduce the MTCT rate below 2.0% and eventually eliminate MTCT of HBV by 2030.

Globally, universal infant Hepatitis B vaccination has achieved significant success in controlling HBV, with the prevalence of Hepatitis B among the paediatric population currently estimated at 0.6%. In Malaysia, the Ministry of Health implemented the universal infant Hepatitis B vaccination programme in 1989, with the aim of achieving a Hepatitis B prevalence of less than 0.1% among the paediatric population. In relation to this, persistent challenges in preventing MTCT must be proactively addressed, particularly in ensuring timely administration of the birth dose vaccine, maintaining a consistent and accessible supply of HBIG, and guaranteeing comprehensive follow-up for all exposed infants.[4]

To address these implementation gaps and align national efforts with WHO hepatitis elimination targets, the Ministry of Health, Malaysia has initiated a pilot project for universal antenatal HBV screening since 2019 in the states of Kedah, Pahang, Terengganu and Sabah.[4] This initiative was designed to test and refine a comprehensive prevention of mother-to-child transmission (PMTCT) strategy within the existing public health infrastructure. The primary objective for this study was the mother-to-child transmission rate of HBV in the state of Kedah, Malaysia. Secondary objectives were including antenatal screening coverage, maternal HBsAg prevalence, and the timeliness and completion rates of key interventions along the PMTCT.

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**Table I: Antenatal hepatitis B screening coverage and maternal HBsAg prevalence in Kedah, 2019–2025 (January-June)**

| Year(s) | Total Antenatal Attendees | Number Screened (RDT) | Screening Coverage (%) | Number Confirmed HBsAg Positive (EIA) | Maternal HBsAg Prevalence (%) |
|---|---|---|---|---|---|
| 2019 | 4, 970 | 4, 653 | 93.62 | 20 | 0.40 |
| 2020 | 7, 851 | 7, 851 | 100.00 | 15 | 0.19 |
| 2021 | 11, 698 | 10, 784 | 92.19 | 8 | 0.07 |
| 2022 | 11, 523 | 11, 523 | 100.00 | 19 | 0.16 |
| 2023 | 6, 259 | 6, 259 | 100.00 | 10 | 0.16 |
| 2024 | 10, 110 | 8, 929 | 88.32 | 11 | 0.11 |
| 2025 (January-June) | 4, 691 | 4, 683 | 99.83 | 9 | 0.19 |
| Total | 57, 102 | 54, 682 | 95.76 | 92 | 0.16 |

RDT, Rapid Diagnostic Test
EIA, Enzyme Immunoassay
HBsAg, Hepatitis B surface antigen

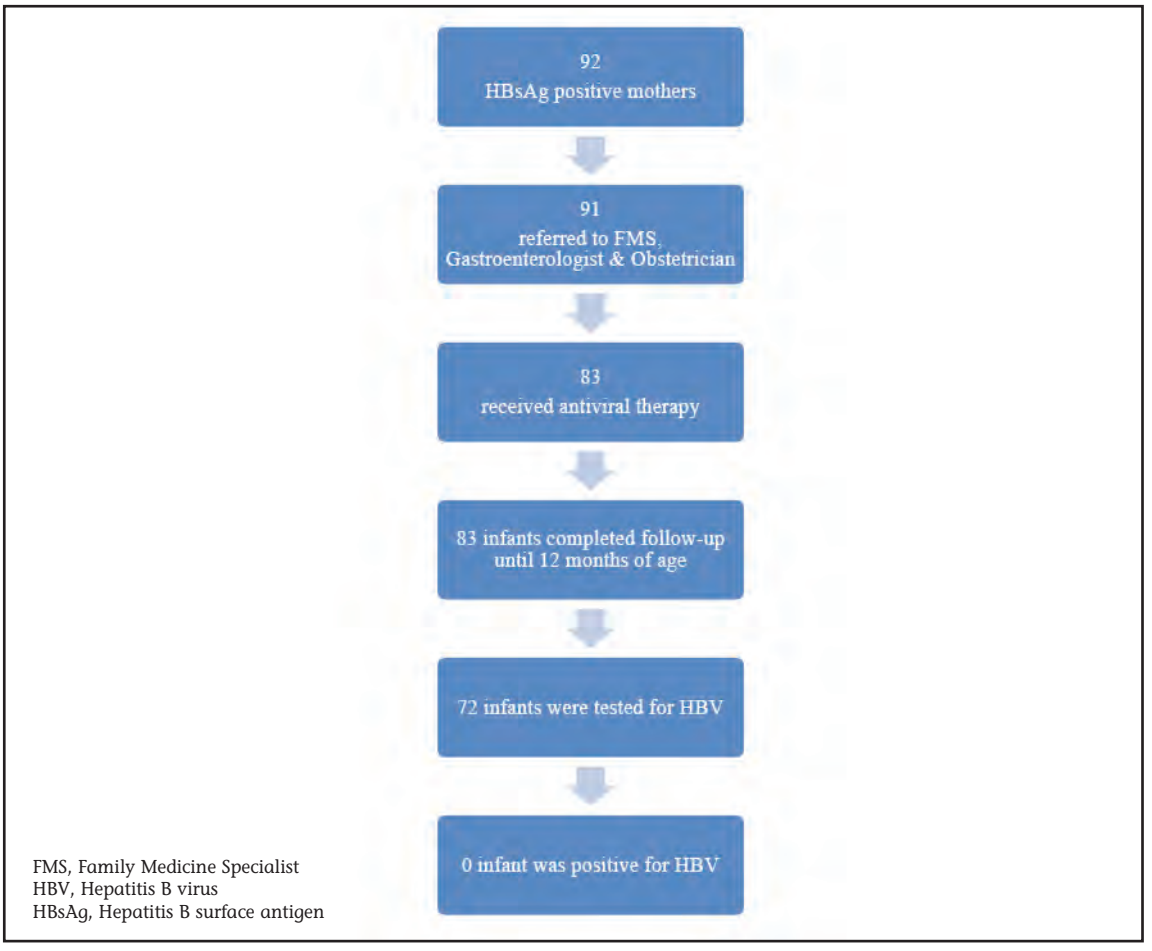


**Fig. 1:** Progression of care for PMTCT of HBV in Kedah, January 2019–June 2025

## MATERIALS AND METHODS

This cross-sectional study utilized secondary data extracted from the existing program registry created by the Communicable Disease Control (CDC) for this pilot project. The selected health clinics of the pilot project were determined by the CDC Unit of Kedah State Health Department, representing every district in Kedah state. The inclusion criteria were all pregnant women who attended antenatal care at the 17 participating government health clinics in Kedah between 1st January 2019 and 30th June 2025. Exclusion criteria were post-natal mothers who were transferred in from other non-participating health clinics.

The variables included in this registry are HBV screening status, HBV screening outcome, referral to specialist care, treatment of antiviral therapy, administration of immunoglobulin and HBV status of their infant. Under PMTCT, the HBV screening was done using rapid diagnostic test kit and subsequently laboratory confirmed by enzyme immunoassay to detect hepatitis B markers such as HBsAg.

All data were analysed using R software.[4] The analysis focused on descriptive -statistics to characterize the program cascade. Key performance indicators were calculated as proportions with 95% confidence intervals to quantify program performance against established targets. PMTCT cascade refers to the sequential steps in the prevention of mother-to-child transmission program, beginning from antenatal attendance and maternal HBV screening, followed by identification of HBsAg-reactive mothers, referral for further assessment, initiation of antiviral therapy when indicated, delivery planning, infant administration of timely hepatitis B birth dose and HBIG, and completion of infant follow-up testing to determine infection status. The cascade is used to evaluate program coverage, continuity of care and gaps at each stage of service delivery.

## RESULTS

Overall, in the PMTCT pilot program between 1st January 2019 and 30th June 2025, 54,682 from a total of 57, 102 antenatal attendees were screened (95.76%). Although the six-year average coverage remained high, annual fluctuations were observed, with a notable decline to 88.32% in 2024. The annual screening coverage and detailed year by-year performance are summarized in Table I. The prevalence of confirmed HBsAg among pregnant women was 0.16%, with a total of 92 mothers confirmed positive via EIA in this cohort.

This figure shows the progression of care among confirmed HBsAg-positive mothers and their exposed infants, including referral for further assessment, infant testing and follow-up, receipt of antiviral therapy during pregnancy, and mother-to-child transmission outcome.

Between January 2019 and June 2025, among the 92 confirmed HBsAg-positive mothers, 91 (98.9%) were successfully referred. Of these, 83 received antiviral therapy during pregnancy. Among the 83 exposed infants, complete follow-up was conducted, and definitive serological outcomes were available for 72 infants, all of whom tested non-reactive for HBsAg. None of the infants were tested positive, resulting in an MTCT rate of 0%.

## DISCUSSION

This study demonstrated a high antenatal HBV screening coverage in Kedah, with an overall coverage of 95.76%. There was a decline in the antenatal HBV screening in 2024. This decline was partly attributed to the transition of program management between different units. The change of program managers would require a smooth transition in term of the database maintenance as well as the training is required to ascertain the competency of the new managers. On top of that, we noticed that there was also a change of implementers at health clinic level and hence their comprehension of the program was important to sustain the continuous implementation of the screening among the antenatal attendees. The lack of understanding of the PMTCT would end up high rate of none screening among the attendees.

In this study, the maternal HBV prevalence was 0.16%. These findings stand in contrast to broader regional data; for instance, an 11.8% HBsAg positivity rate was reported among pregnant women in Northern Uganda.[5] Furthermore, while a pooled prevalence of 6.8% was found across Africa[6], regions in Southern China saw a decline from 14.5% in 2015 to 8.19% in 2020.[7] On a global scale, it is estimated that 71.4 million women of childbearing age were living with chronic HBV in 2021.[8] In short, the prevalence of HBV among antenatal mothers in Kedah was relatively low compared to various studies worldwide and this could be attributed to mandatory inclusion of Hepatitis B vaccination in Malaysian National Immunization Program in 1989.

As for the MTCT rate in Kedah, the low MTCT rate is certainly consistent with outcomes reported in settings with strong prevention programs. For instance, the MTCT rate has been reduced to 0.44%–0.60% through Triple Elimination initiatives and mandated antiviral prophylaxis for mothers with high viral loads in Shandong China.[9] Similarly, in low-endemic settings such as England, maternal HBV prevalence has been reported at approximately 0.5%–0.7%, with achievements exceeding WHO 2030 targets, supported by high screening coverage and timely birth-dose vaccination.[10] In Malaysia, published data on hepatitis B prevalence among antenatal mothers remain limited. A weighted analysis in Ipoh, Perak reported a prevalence of 1.35%, with 23.1% of HBsAg-positive pregnant women requiring antiviral prophylaxis due to high viral loads.[11] The findings from Kedah therefore highlight the effectiveness of a screen-and-treat model within the PMTCT pathway.

Although the MTCT rate in the pilot project was 0%, there were limitations and challenges in the progression of care. For instance, the attrition rate at every stage of progression of care was relatively prominent. In relation to this, there was one antenatal mother who were not referred to specialist for consultation and the reason was mainly due to refusal from patient. To overcome this, a proper and comprehensive counselling was warranted to inform the mother on the risk of vertical transmission to her newborn. On top of that, treatment uptake was only 91.2% which could have risk the vertical transmission to the newborn. This gap warrants a future exploration of the underlying causes of none treatment among the 8.8% antenatal mothers.

In term of the progression of care, the PMTCT shows high referral rate (98.9%) and treatment uptake (91.2%). On top of that, all of the mothers who received the antiviral therapy had 100.0% of follow up for their infants up-till 12 months of age. However, there were approximately 86.7% of the infants underwent the serological testing for HBV. Out of the 72 infants, the MTCT rate was 0%. Another gap detected in the pilot project was the attrition of infants follow up until 12 months whereby there were 11 infants who did not complete the 12 months follow up and hence no serological test was done to assess the transmission rate. To overcome this, a robust tracing system spanning the health clinics and paediatrics department is crucial to reduce attrition rate and hence to reduce transmission rate of HBV.

The limitations of this study include the data completeness as the main source of data was secondary. In addition, variables available in the database was also limited as the data collection concentrated in monitoring the program flow and planning of the program. Hence, there was specific documentations on the underlying reasons causing the attrition among the antenatal mothers and the infants during the progression of care for PMTCT.

## CONCLUSION

Overall, the MTCT rate of the pilot project in Kedah was satisfactory at 0% among all the antenatal mothers who were treated and completed the follow up plan. On top of that, the prevalence of HBV among the antenatal mothers was relatively low at 0.16% with a relatively high HBV screening (95.8%) among the antenatal attendees. These robust findings emphasize on the importance of PMTCT in preventing vertical transmission of HBV and in line with the goal set by WHO in reducing the MTCT rate below 2.0%.

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## CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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