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Assessment of Timely Uptake of Hepatitis B Birth Dose Vaccine in a Secondary Health Facility in Delta State, Nigeria

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ABSTRACT

Background: Chronic hepatitis B virus (HBV) infection is a significant global health concern, with an estimated 254 million individuals affected worldwide. Nigeria has one of the highest burdens of hepatitis B virus infections globally and the highest burden among children under five years of age. With a population of 6.8 million, the prevalence of hepatitis B in Delta state is 8%. To reach the elimination goals for viral hepatitis, it is crucial to improve timely hepatitis B birth dose (HepB-BD) coverage by expanding access to HepB-BD.

Objectives: To determine the percentage of timely HepB-BD vaccine uptake as well as the extent of HepB-BD deferment amongst newborns delivered in a secondary health facility.

Materials and Methods: This study was a retrospective, non-invasive cohort assessment which deployed a convenience sampling technique to inspect child health cards of all infants brought to the antenatal clinic of Central Hospital Agbor, a secondary health facility in Delta State, Nigeria, for their routine vaccinations within a 4-week period in January 2024.

Results: 209 infants (43% male, 57%) female, were assessed for HepB-BD. Only 12 infants received the HepB-BD within the first 24 hours of life, while 197 received theirs after 24 hours. Timely HepB-BD uptake was found to be 5.7% within this health facility. Delays in the uptake of HepB-BD vaccine varied from 1 day (minimum) to up to 43 days (maximum) amidst absence of a clear HepB-BD policy in the facility. All 12 infants who received the timely HepB-BD vaccine were either born late on a Wednesday, or on a Thursday as matched on the calendar. A total of 15 infants out of 197 who received the HepB-BD vaccine, post-24 hours, were also observed to be born on a Thursday, but after 4pm.

Conclusion: Timely and deferred HepB-BD uptake in Central Hospital Agbor, Delta State were found to be 5.7% and 94.3% respectively. Effort is needed to further address barriers to HepB-BD timely coverage to prevent transmission from mother to child.

1. INTRODUCTION

Chronic hepatitis B virus (HBV) infection is a significant global health concern, with an estimated 254 million individuals affected worldwide.[1] Globally, it is estimated that 21 countries account for 80% of the total burden of HBV infections within the general population. From the 2024 Global Hepatitis Report across all regions according to the World Health Organization (WHO), only 13% of people living with HBV infection have been diagnosed and only 3% received antiviral therapy at the end of 2022.[1] Africa accounts for 63% of all new hepatitis B infections however, , only 18% of newborns received the birth dose as at 2022 to prevent transmission of hepatitis B from mother to child.[1]

HBV is transmitted through direct contact with infected blood, unprotected sex with an infected individual, use of contaminated or non-sterile medical or injection equipment and most commonly, from an infected mother to her newborn during childbirth.[2] Children infected with hepatitis B during childbirth have a greater than 90% chance of developing a chronic or lifelong infection of HBV and are a significant source of new infection.[3,4,5,6] To prevent mother-to-child transmission (MTCT) of HBV during birth, the WHO recommends that all countries include at minimum the three doses of HBV vaccine within the routine immunization schedule with the first dose given within 24 hours of birth (HepB-BD). All countries have introduced the HBV vaccine infant series in the WHO African Region, given at six weeks of age, ten weeks of age, and 14 weeks of age (pentavalent or hexavalent combination vaccination). However, in the WHO Africa region, only 12 (26%) of the 47 member countries have introduced HepB-BD.[7] Without HepB-BD, children are still at risk of acquiring hepatitis B during the most vulnerable initial six weeks of life.

Nigeria faces one of the highest burdens of hepatitis B prevalence globally at approximately 12.2% and accounts for 8.3% of the global burden of the disease.[8] The burden in children under five years of age is also considered high. While Nigeria has offered HepB-BD since 2004, the uptake of its timeliness is variable by region due to administration barriers. According to the Nigeria Ministry of Health, newborns born in health facilities are eligible to receive free or low-cost HepB-BD before discharge provided by the government. Babies born in health facilities and discharged without receiving HepB-BD and babies born at home could receive HepB-BD at a government-run clinic within the first two weeks of life. Vaccination coverage in Nigeria varies but is low. According to the WHO vaccine-preventable diseases monitoring system, the HepB-BD coverage within Nigeria in 2019 was approximately 52%, with some states reporting much lower coverage.[8] Within this same database, only 57% of children received the three-dose recommended series of hepatitis B vaccination through the pentavalent vaccine, leaving almost half of children vulnerable to future hepatitis B infection.[9,10] A community-level study noted a significant disparity in timely HepB-BD coverage at only 23% in some states (range 12%-40%), highlighting a discrepancy in WHO reported and actual timely HepB-BD.[10,11,12]

Recent report from the Nigeria Demographic Health Survey(NDHS) showed that the Delta State HepB-BD vaccine coverage rose to 87.3% which covered up to two weeks of birth (monovalent vaccine), while three doses administered in the pentavalent form given at 6, 10, and 14 weeks recorded 92.4%, 90.8% and 85.7% coverage respectively [13]. No record of timely administration within 24hours has been documented in the State.

To reach the elimination goals for viral hepatitis, it is crucial to address barriers in order to improve timely HepB-BD coverage. Previous studies conducted in Nigeria have found that common barriers to timely HepB-BD administration include scheduled immunization days, misconceptions of health care workers, lack of policy on timely administration, lack of a point person in charge of ensuring administration is prioritized, home births, traditional birth attendants as well as limited knowledge on the importance of timeliness[3]. To understand barriers to HepB-BD administration in Delta State and ultimately work towards addressing them, this study compares a local facility to the state reported HepB-BD coverage and the extent of the deferred HepB-BD in the facility.

HepB-BD vaccine when administered to every child born to a sero-positive mother is capable of breaking the chain of vertical transmission of the virus. Hence, X-raying the extent of HepB-BD vaccine uptake amongst infants born in Central Hospital Agbor will help determine the extent to which infants born in the facility are at risk of perinatal transmission of hepatitis B virus. Findings from this assessment will help health managers and policy makers make informed decisions on needed policy adjustments and implementation to strengthen HepB-BD vaccine coverage in the facility and by extension, Delta State.

Objectives

1. To determine the levels of uptake and deferment of HepB-BD vaccine among newborns in Central Hospital Agbor.

MATERIALS AND METHODS

This study was conducted in Central Hospital Agbor, Delta State. Central Hospital Agbor is a 250-bed government-owned healthcare facility under the management and control of the Delta State Hospitals Management Board. It is situated in the heart of Agbor town, Ika South Local Government Area, providing comprehensive medical services, including consultation, counselling, and treatment to patients in the area. Established in 1906 by the colonial administration, the hospital's primary focus was to cater to the medical needs of colonial officials, civil servants, and their families, as well as the local population initially free-of-charge. During the civil war, the hospital operated as a clinic, providing medical care to military personnel between 1967 and 1970. At that time, it consisted of four blocks and an emergency ward. Since then, the hospital has experienced growth in both staff strength and infrastructural development. Following the creation of Delta State in 1992, the hospital was upgraded to a central hospital, solidifying its position as a key healthcare provider in the region.

Today, Central Hospital Agbor serves as the Hospitals Management Board's (HMB) Zonal hospital to 6 secondary health facilities, serving a catchment population of approximately 229,000. It has also been approved by the Delta State Government and accredited by the National Universities Commission (NUC) to serve as the teaching centre for students in the medical field.[14]

This study was a retrospective, non-invasive cross-sectional assessment, using a convenience sampling method to inspect child health cards for all infants brought to the antenatal clinic of the facility for their routine vaccinations. Before child health cards were inspected, mothers/caregivers were duly informed on the nature of the study to seek consent to inspect their children's health cards. While no identifiable data was collected, data specific and relevant to this assessment collected were:Date of Birth (DoB) of child as recorded in child health card, Date of administration of HepB-BD (Hep B0) as recorded in child health card, and Gender.

In order to reduce biases from nursing officers in reporting HepB-BDs, child health cards were directly inspected by the assessor to obtain the exact date of administration of the HepB-BD for every child.

Data Collection Tool

The data collection tool was a designed pro forma with entries for gender, date of birth and date of administration of HepB-BD vaccine.

Sample Size Determination

Using the Cochran's[15] modified formula for determining sample size for a finite population,

Sample size $=[Z^2.p(1-p)/e^2]/1+(z^2.p(1-p)/e^2N$

Where, **z** is z-score = 1.96 at 95% confidence interval

e is the margin of error = 95% (0.05)

N is the population size = 150 children for vaccination every Thursdays from records

p is the population proportion = estimated as 60% of HepB-BD uptake according to the Delta State Primary Healthcare Development Agency.

From the foregoing, the sample size for this assessment was 107. This meant at least 107 child health cards were expected to be inspected to have a confidence level of 95% that the outcome from this assessment was within +-5% of the true HepB-BD uptake level for the facility.

ETHICAL APPROVAL: Ethical approval for this study was obtained from the Ministry of Health Research Ethics Committee (MOHREC) with approval reference HM/596/T^2/238. Verbal consent from mothers at the facility were also sought before health cards were assessed.

RESULTS:

In the secondary health facility, 209 infants, 43% male, 57% female, were assessed for HepB-BD (Fig.1). Only 12 infants received the HepB-BD within the first 24 hours of life, while 197 received theirs post 24 (Fig.2)

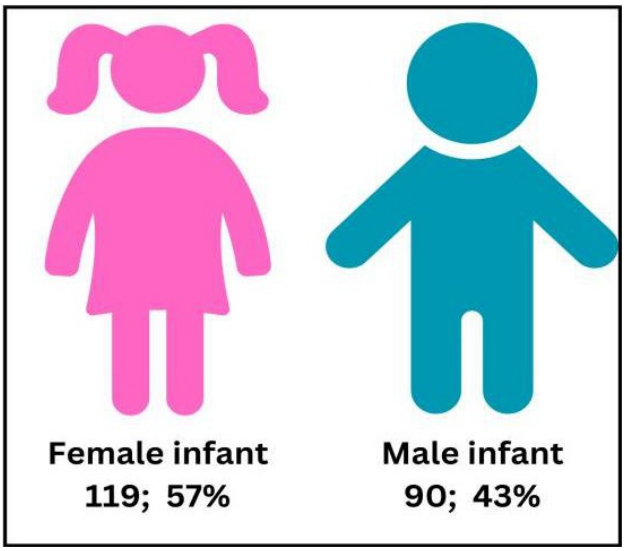

Figure 1: Gender-based distribution of infants brought to Antenatal clinic for routine vaccinations in Central hospital, Agbor, Delta State.

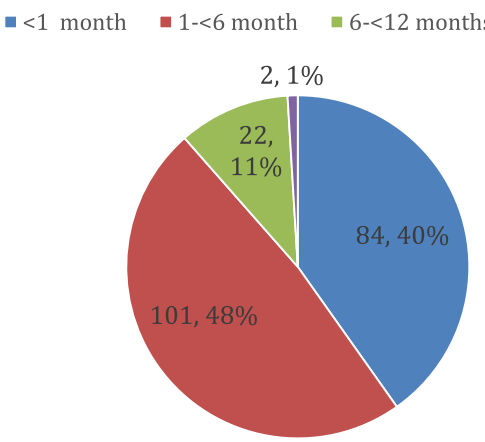

Figure 2. Age distribution of infants

Table 1:The levels of timely and deferred HepB-BD vaccine uptake amongst infants brought to ANC for routine vaccinations in Central Hospital Agbor, Delta State

	Variable	Frequency (%)	% uptake
HepB-BD administered within 24 h of birth	Male	3 (25)	5.7
	Female	9 (75)	
HepB-BD administered after 24 h of birth	Male	87 (44)	94.3
	Female	110 (56)	

DISCUSSION:

Nigeria is one of the top 10 countries in the world that accounts for two-thirds of the global burden of hepatitis, as mother-to-child transmission (MTCT) of hepatitis B virus (HBV) is projected to cause 50% of new HBV infections by 2030 without intervention.[1] The hepatitis B Birth dose (HepB-BD) vaccine administered within 24hours, is a defining dose in preventing mother-to-child transmission[16] and Nigeria has since 2004 included it into its National Programme on Immunization (NPI) for the Country[16]. Timely HepB-BD uptake for this facility was found to be 5.7% despite the availability of properly stored HepB-BD vaccine in the solar-powered refrigerator supplied by the EPI program supported by Gavi, the vaccine alliance. An observed delays in the uptake of HepB-BD vaccine varied from 1 day (minimum) to up to 43 days (maximum) amidst absence of a clear HepB-BD policy in the facility. This is significantly lower than the WHO target of at least 90%. This observed low level of uptake is in sharp contrast to the 87.3% level of uptake for Delta State as reported in the 2023-2024 Nigeria demographic health survey (NDHS)[13]. This significant disparity between the reported and actual timely HepB-BD is primarily due to the non-consideration of the actual time the vaccine was administered as there is currently no provision on the child health card to capture deferred HepB-BD. All 12 infants who received the timely HepB-BD vaccine were either born late on a Wednesday, or on a Thursday as matched on the calendar. This increased their chances of receiving the HepB-BD vaccine within 24 hours after birth. A total of 15 infants out of 197 who received the HepB-BD vaccine, post-24 hours, were also observed to be born on a Thursday. On inquiry from mother, they were said to be born later than 4pm in the afternoon when the ANC clinic was closed.

Strength and Limitation of this study:

The major strength of this study was in the methodology deployed in extracting actual timely birth dose administered within 24 after birth. Rather than relying on maternal or Nurses' reports, dates of birth and dates of administration of the birth dose vaccine as recorded on child health cards were compared. Discrepancies beyond one day were recorded as deferred or delayed birth dose. The limitation was that only one facility was used for this study to make a far-reaching statement as a reflection of the State's timely HepB-BD uptake.

CONCLUSION:

Timely and deferred HepB-BD uptake in Central Hospital Agbor, Delta State were found to be 5.7% and 94.3% respectively. HepB-BD uptake in the facility was below the reported 60% by the State Ministry of Health. While HepB-BD is provided by the Federal Ministry of Health in Nigeria (since 2004) there are major gaps in data reporting and actual uptake of HepB-BD. Nigeria has the potential to significantly impact the global burden of disease for hepatitis B if birth dose is appropriately scaled up to elimination target goals.

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Conflicts of Interest:

The authors had no conflicts of interest capable of skewing the final outcomes of this study.

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