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# Risk of Mother to Child Transmision of Hepatitis B among Children

[1, 2]Favour Osazuwa and [3]Anikwe Haryana Chika
[1]Department of Medical Microbiology,
University of Benin Teaching Hospital, P.M.B. 1111, Benin City, Nigeria
[2]Medical Microbiology and PEPFAR Laboratory, Federal Capital Territory Administration,
Wuse District Hospital, P.M.B. 24, Federal Capital Territory, Abuja, Nigeria
[3]Department of Medical Microbiology, University of Abuja Teaching Hospital,
Gwagwalada, Abuja, Nigeria

**Abstract:** Mother to child transmission of hepatitis B is now been recognized as a major route of acquisition of hepatitis B infection. This study thus aimed to evaluate the rate of vertical transmission of hepatitis B in a cohort of mothers and their children in Abuja, Nigeria. This study was carried out between May to September 2011 in Abuja, Nigeria. In this cross-sectional study, the prevalence of sero-markers to carrier status of hepatitis B (HBsAg) and disease progression and capacity for infectivity (HBeAg) in paired sera samples of apparently healthy mothers and their children in sub-urban communities of Lugbe and Gwagwalada, federal capital territory, Abuja, Nigeria was investigated. Informed consent was received from parents (Mothers and fathers) to include their children. Only children between 6 months to 3.5 years were included the study. Only subjects positive for HBsAg were screened further for HBeAg. A total of 250 mothers and their 291 children were the study subjects. Overall prevalence of HBsAg in the mothers and children studied were 33 (13.2%) and 20 (6.9%). About 9 (27.7%) mothers who were positive for HBsAg were seropositive for HBeAg. A total of 7 (35.0%) children out of 20 HBsAg seropositive children were positive for HBeAg. The risk of vertical transmission of hepatitis B from mothers to their children was high; 7 (77.7) children out of 9 HBeAg positive mothers were HBeAg positive. All 7 HBeAg positive children were children of HBeAg seropositive mothers making a total percentage of perinatally transmitted hepatitis B to be 77.7%. The risk of vertical transmission of hepatitis B was high. Screening for hepatitis B in pregnant women should be a routine practice in the antenatal clinics so as to institute an early immunization for at risk infants after birth.

**Key words:** Vertical transmission, HBsAg, HBeAg, hepatitis B, seropositive

## INTRODUCTION

Hepatitis B virus infections is now been recognized as one of world's major public health problem worldwide. Hepatitis B virus is known to be the major cause of liver infections in the world (Ryder and Beckingham, 2001). Hepatitis B causes acute and chronic hepatitis and it is transmitted by blood to blood contact, percutaneous during birth and unprotected sexual intercourse (Lau and Wright, 1993). This highly infectious virus has capacity for easy transmission from one infected individual to another (Lau and Wright, 1993).

Mother to child and contact associated transmission occurs in endemic regions (Andre, 2000). Young children represent a large population of at risk for hepatitis B in Africa (Andre, 2000), recovery from acute infection is low, up to 80% progresses to chronic infection with chronic carriers capable of developing hepatocellular carcinoma being up to 10-20% of the population (Andre, 2000). Hepatitis B is very concerning for the newborn without intervention a child born to a mother with both HBsAg and HBeAg has approximately a 70-90% chance of chronic hepatitis B infection within the first 6 months of life with nearly 10% in utero transmission (Wilcox, 2010). It has been noted that receiving hepatitis B immunoglobulin at birth and the standard doses of hepatitis B vaccination regimens decreases the chronic chance by 90% (Wilcox, 2010). Of note, a high viral load of hepatitis B has been associated with a higher risk of transmission of hepatitis B even in the midst of preventive measures (Van Zonneveld *et al*., 2003).

In view of known capacity for vertical transmission of hepatitis B to their newborns, early diagnosis of hepatitis B will be of benefit to reduce the possible chronicity

**Corresponding Author:** Favour Osazuwa, Department of Medical Microbiology, University of Benin Teaching Hospital, P.M.B. 1111, Benin City, Nigeria

associated with hepatitis B infection. Determination of a possible vertical route of hepatitis B transmission in mothers to their children will help to know the frequency of transmission of hepatitis B to their unborn children. This study thus aimed to determine the risk of transmission of hepatitis B from mothers to their children in Abuja, Nigeria.

## MATERIALS AND METHODS

**Study area and design:** This study was a cross-sectional study carried out between May 2011 to September 2011 among mothers and their children resident in Gwagwalada and Lugbe district, two sub-urban communities of Abuja, Federal capital territory, Nigeria. Gwagwalada is the largest satellite community of Abuja and play host to the University of Abuja and University of Abuja teaching hospital. Gwagwalada is made up of mainly peasant farmers, market women, University students and University lecturers. Lugbe is a residential area of Abuja with civil servants making a majority of the population.

This community based study included mothers and children whom were apparently healthy individuals. Prior to carrying out this study, a community based public health awareness programme carried out by the community development service of the national youth service corps in the two communities on hepatitis B with a large attendance of mothers and young adults was done. In addition, a house to house awareness on hepatitis B was also carried out. Overview of hepatitis B, its transmission, clinical course, severity, diagnosis and treatment constituted a major part of the awareness campaign. Mothers in the two communities were approached to participate in the study. Informed consents were received from 250 mothers and were enrolled for the study. Parents (mothers/fathers) gave consent for the inclusion of 291 children of theirs between the age group 6 months to 3.5 years.

**Sample collection and analysis:** About 2 mL of venous blood was aseptically collected from mothers and their children and dispensed into plain container tubes. Samples were labeled appropriately. These paired samples were then transported securely to the medical microbiology laboratory of Wuse district Hospital, Abuja, for laboratory analysis. Samples were separated in the laboratory to obtain serum; this was stored in the fridge until analysis.

Paired serum samples were analyzed for Hepatitis B surface Antigen (HBsAg). Samples positive for HBsAg were further screened for sero-positivity for Hepatitis B e Antigen (HBeAg). Rapid diagnostic Elisa kits (Clinotech Diagnostics, Canada) were used to determine sero-positivity for HBsAg and HBeAg.

Overall percentage risk of vertical transmission of hepatitis B was calculated against total number of children HBeAg positive that were born to mothers that were HBeAg positive.

## RESULTS AND DISCUSSION

Total 250 mothers within the age range 18-45 and their 291 children between the ages 6 months to 3.5 years were studied for the sero-prevalence of HBsAg and HbeAg. Total 33 (13.2%) mothers were positive for HBsAg out of which 9 (27.7%) of HBsAg sero-positive mothers were positive for HbeAg. Total 20 (6.9%) of the children was sero-positive for HBsAg and 7 (35.0%) of HBsAg seropositive children were sero-positive for HBeAg.

The risk of transmission was high, 17 (51.5%) of HBsAg positive children were born by HBsAg seropositive mothers. Total 7 (77.7) children out of 9 HBeAg positive mothers were HBeAg positive. All 7 HBeAg seropositive children had HBeAg seropositive mothers making a total prevalence of possible vertically transmitted hepatitis B of 77.7% (Table 1). Total 3 (15.0%) children were HBsAg seropositive but were not children of HBsAg seropositive mothers, this group of HBsAg seropositive children must have acquired the infection from a different source. HBeAg positivity was highest in older children (children >2 years) with children in the age group of 2 years to 2 years/6 months having the highest prevalence (Table 2).

Mother to child transmission of hepatitis B is known to be common in areas of high endemicity for the virus (Shi *et al*., 2010). The different routes of mother to child

Table 1: Prevalence of HBsAg and HBeAg among mothers and their children

| Sbjects | No. of positive for HbsAg (%) | No. of positive for HbsAg (%) |
|---|---|---|
| Mothers (n = 250) | 33 (13.2) | 9 (27.7) |
| Children (n = 291) | 20 (6.9) | 7 (35.0) |

Table 2: Age wise seroprevalence of HBsAg and HBeAg in the children studied

| Age (years) | No. of studied | No. of positive (%) HbsAg | No. of positive (%) HbeAg |
|---|---|---|---|
| 6 months to 1 year | 28 | 1 (5.0) | 0.0 |
| 1 year to 1 year/6 months | 30 | 3 (15.0) | 0.0 |
| 1 years/6 months to 2 year | 43 | 6 (30.0) | 1 (14.3) |
| 2 years to 2 year/6 months | 73 | 7 (35.0) | 4 (57.1) |
| 2 years/6 months to 3 years | 64 | 2 (10.0) | 2 (28.6) |
| 3-3.5 years | 53 | 1 (5.0) | 1 (14.3) |
| Total | 291 | 20.0 | 7.0 |

transmission of hepatitis B includes in utero (natural and during amniocentesis) at birth transmission (during delivery) and postnatal transmission (breastfeeding transmission) (Ranger-Rogez and Denis, 2004).

In this study, the risk of perinatal transmission of hepatitis B to children in Abuja was evaluated. Total 33 (13.2%) of mothers studied were positive for HBsAg and 9 (27.7%) of HBsAg seropositive mothers were seropositive for antibodies to HBeAg. Total 20 (6.9%) of the children were positive for HBsAg. Total 17 (51.55) were children of HBsAg seropositive mothers. Total 7 (35.0) of HBsAg seropositive children was seropositive for HBeAg. All 7 HBeAg positive children had HBeAg positive mothers. The relative of risk of vertical hepatitis B transmission was 77.7%. The risk of vertical transmission of hepatitis B in this population was high. Sub-Saharan Africa and Asia are known to lie in belt of high endemicity (8-15%) for hepatitis B (WHO, 1999). HBV transmission is known to vary from one part of the world to another in high endemicity areas like Nigeria; infections generally occur during childbirth and during early childhood (Custer *et al*., 2004).

Hepatitis B infection may be acute or chronic. An acute infection with hepatitis B is characterized by the presence in serum of HBsAg and HBeAg and the development of anti-HBC immunoglobulin (Beck and Nassal, 2007). A chronic infection is defined as the continued presence of HBsAg in serum for >6 months or presence of HBsAg without anti-HBC immunoglobulin (Lok and McMahon, 2007). The risk of a possible mother to child transmission of hepatitis B has been known to be higher in mothers positive for both HBsAg and HBeAg (Diasteng, 2008). The risk for a neonate to be infected is about 80-90% in mothers with HBsAg positive for HBeAg and DNA positive (Ranger-Rogez and Denis, 2004). In the study the risk of transmission of hepatitis B from mothers to their children was high, 7 (77.7) children out of 9 HbeAg positive mothers were HbeAg positive. Singh *et al*. (2010) in a case control study involving 12 transmission cases and 52 controls selected from a provincial registry in Canada investigated levels of HBsAg, HBeAg and HBV DNA in the cohort of subjects, the result of the study shows that women who transmitted HBV to their infants were significantly more likely were significantly more likely than control women to test positive for HBeAg (77.8 vs. 23.1%; $p<0.05$). In that study, the researchers conclude that women with Hepatitis B Virus (HBV) infection who were Hepatitis B e Antigen (HBeAg) positive and had high HBV viral load during pregnancy were more likely to transmit the virus to their infants even though the babies received HBV prophylaxis (Singh *et al*., 2010). In a Pakistani study involving 275 mothers and their 304 children, the risk of transmission of HBV was 66.7%, 2 children of 3 mothers that were HBeAg positive were found to HBeAg positive (Javed and Naz, 2011).

The relationship of HBeAg and anti-HBe antigen in the mother to child transmission of HBV was studied by Beasley *et al*. (1977); asymptomatic HBV carrier women and their children were used. Sera of carrier women and their children were studied for presence of HBeAg and anti-HBC. The study found that 85% of babies born to HBeAg positive mothers were HBsAg positive. The study found a positive correlate between positivity for HBeAg and transmission of HBV to their children. Following infection with HBV, HBsAg is the first marker to appear, this if followed by virion molecule, Viral DNA and soluble antigen, HBeAg and HBcAg (Vierling, 2007). Many at times there is early clearance of HBcAg due to early presence of anti-HBC. HBeAg correlates with the presence of the virus and thus its infectivity (Vierling, 2007). Generally, HBeAg positive carriers possess a higher infectivity rate.

The prevalence of HBsAg and HBeAg was significantly higher among children in the age group 1-2 year and 6 months old, this finding is similar to reports from an earlier study (Beasley *et al*., 1977). The incubation period of hepatitis B is between 6 weeks to 6 months (40-180 days), an average of 90 days or 3 months (Locarnini, 2004). Serological makers for carrier status of HBV (HBsAg) begin to appear between 2-8 weeks after infection (Glebe and Urban, 2007). In the event of inability of the immune system to clear of the virus which is known to be common in perinatally infected children, there is persistence of HBsAg leading to a carrier status with increasing age for >6 months and many at times continued viral replications leading to the development of HBeAg (Glebe and Urban, 2007).

## CONCLUSION

This study shows the risk of mother to child transmission of HBV was studied in Abuja, Nigeria. Total 77.7% of children were confirmed to have had a possible vertical route of infection with hepatitis B. Screening for HBsAg and HBeAg in pregnant mothers early in the periods of pregnancy should be done routinely to allow for early intervention.

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