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Mother -To -Child Transmission of Hepatitis B in Jos Metropolis

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ABSTRACT

Background: Hepatitis B virus infection is a major public health issue worldwide and more seriously in Africa and Asia[3]. In Jos, like in the most parts of Nigeria, information on mother to child transmission of HBV is scarce. This study was undertaken to determine the mother- to- child transmission of hepatitis B markers at delivery.
Objectives: To determine the prevalence of HB s Ag in maternal blood and that of cord blood at delivery at JUTH .To determine the proportion of HB s Ag positive to HB e Ag positive on maternal and also proportion of the same markers in the cord blood.
Method: Descriptive cross sectional study
Result: The results of the study showed that the prevalence of HB S Ag among women at delivery in Jos metropolis is 12.77%. It also revealed that the prevalence of HB S Ag on cord blood is 2.2%, which is an issue of concern. Also, the proportion of HB S Ag to HB E Ag in women at delivery is 23:3. That is, 13.04% of those that are HB S Ag positive were infectious. Association was statistically significant. There was no HB E Ag positivity in all the 4 cord blood that was HB S Ag positive.
Conclusion: Jos is an area of high endemicity for hepatitis B virus infection. In line with WHO recommendation of routine antenatal screening for HB's'Ag. for pregnant women at booking,[2], routine screening for HB S Ag on all pregnant women should be introduced at the booking clinic.

INTRODUCTION

Hepatitis B virus (HBV) is a double stranded DNA virus belonging to Hepadnaviridae family. Whose incubation period is between 6 weeks and 6 months [1] .HBV infection affects over 350 million people worldwide and about 2 million die annually of HBV-related chronic hepatic disease[2,3]. Liver cirrhosis and hepatocellular carcinoma lead to death in these patients[2.]

The prevalence of HBV infection according to the geographical area, may be high (≥8%), intermediate (2-7%), or low (≤2%)[3]. Nigeria is classified among the countries that are highly endemic for viral hepatitis[4]. The prevalence of HB s Ag in normal population in Nigeria ranges from 2.7% to 13.3%[5, 6]

Generally, pregnant women have depressed immunity, thus infection of HBV is of clinical importance. Acute Viral hepatitis is one of the medical disorders in pregnancy known to be associated with to high morbidities and sometimes mortalities because it could lead to fulminant hepatitis which, though rare (1-2%), is associated with a dramatically high mortality (63-93%) [7].

Hepatitis B e antigen (HBeAg) is a soluble non-particulate antigen that is found only when HBsAg is present[1]. Pregnant women who are HB e Ag positive in the third trimester frequently transmit this infection to the offspring in up to 90% of cases in the absence of immunoprophylaxis, whereas those who are negative rarely infect their offspring[1, 8]. Amongst those infected, 90% will develop chronic infection and 25% will die due to complication of liver disease [7, 10].

HBV is transmitted primarily through parenteral and sexual exposure to HB s Ag positive blood or other body fluid from those who are chronic HBV carriers or who have acute hepatitis B [3].

HBV is also transmitted prenatally, with the possibility of vertical transmission[8]. Since a large number of these transmitted cases progress to chronicity, infected infants can initiate new cycle of both horizontal and vertical infection. Infection acquired during the perinatal period has the highest risk of chronicity [7, 8 47, 48]. Prevention of perinatal transmission is thus important to prevent chronic carrier state. Recent studies have shown a higher incidence of low birth weight among infants born to mothers with acute infection during pregnancy[9]. However, knowledge about mother to child transmission of hepatitis B in Jos, which is the researcher's area of study is scarce, hence the need for the study.

Statement of the Problem

Nigeria is classified among the countries that are highly endemic for viral hepatitis[4]. The prevalence of the viral infection amongst pregnant population is as high as 8.3%[63] in Zaria and value as high as 13.3%[5] has also been reported. Perinatal transmission is an important route for neonatal infection, because infection acquired during the perinatal period has the highest risk of chronicity, thereby perpetuating the vicious cycle[47, 48]. Prevention of perinatal transmission is thus important to prevent chronic carrier state. This would only be possible if the prevalence of mother to child transmission of hepatitis B virus is identified. There is scarcity of knowledge in this area of study, so that the problem on ground in relation to the study is identifying and examining the rate and extent of mother-to-child transmission of hepatitis B in Jos metropolis.

Study Hypothesis

This study hypothesizes that the prevalence of hepatitis B virus infection in pregnancy is comparable to that in the general population and mother to child transmission do occur at birth.

Justification of the Study

The prevalence of HB s Ag in normal population is high and it is said to be between 2.7% to 13.3% [5, 6.]

Hepatitis B infection in pregnancy is an important health issue because infected mothers can transmit same to their offspring with such consequences as low birth weight babies, chronic hepatitis, liver cirrhosis and possible hepatocellular carcinoma[7].

Ninety percent of perinatal infection can be prevented if HB s Ag positive mothers are identified and their newborn treated promptly with hepatitis B immunoglobulin and HBV vaccine [10.] Transmission of HBV will add to a large number of carriers in the community and becomes a public health problem. This study which is aimed at ascertaining the rate of mother -to- child transmission of hepatitis B markers at delivery, will help to inform policy formulation and programming in health planning for women and children in Jos metropolis in particular, and Nigeria (including the outside world) in general. It is for this reason that this dissertation **mother- to- child transmission of Hepatitis B in Jos metropolis** was conducted.

Aim

General: The aim of the study is to determine if the transmission of hepatitis B virus from mother to child in Jos metropolis occurs. It is further to identify the extent to which this occurrence or otherwise is evident, and to proffer solutions as applicable.

Specific Objectives Are:

1. The study is designed to determine the prevalence of HB s Ag among women at delivery at Jos
2. It is to determine the prevalence of HB s Ag on cord blood after delivery at Jos
3. In addition to the above, it is also to determine the proportion of HB s Ag positive women that are HB e Ag positive
4. It is also to determine the proportion of HB s Ag positive cord blood that are HB e Ag positive
5. Finally, based on the above, to see if it is rational to recommend the inclusion of routine hepatitis B screening test for pregnant women

LITERATURE REVIEW

Hepatitis B Virus

HBV is a small (42-nm) DNA virus that contains partially double-stranded DNA within its core[12]. Using its own DNA polymerase for replication, the virus is able to reproduce within a host's infected hepatocytes, drawing from the cell's pool of nucleotide precursors[12].

Hepatitis B surface antigen (HBsAg) is the HBV serum marker that has come to be used most commonly in clinical situations and screening protocols. Discovered by Blumberg and co-workers in 1965[13], it initially was not known to be a virus-associated marker. The antigen, first isolated in the serum of an Australian aborigine during a study of serum protein polymorphisms (hence it being labeled the “Australia antigen”) [14], was found incidentally to cross-react with the serum of patients who have had multiple blood transfusion. It was later found to be present in the serum of institutionalized patients and, it was believed to be possibly associated with Down syndrome.[15]

Subsequent work by Blumberg's group and others established a link between the newly identified antigen and acute hepatitis B, an association confirmed by electron microscopy identification of particles dense with the antigen in the serum of patients who were acutely ill with hepatitis.[16] Those particles are now known to represent incomplete portions of the viral envelope, synthesized in great excess during the process of viral replication[12, 16]. In addition, intact viral particles bear the surface antigen on their outer envelope[16]. The presence of HBsAg in serum indicates infectivity[16], although such presence alone cannot distinguish acute from chronic infection, an often confusing exercise that requires a more complete elaboration of HBV-related serologies. Although HBsAg is the first antigen detectable in the course of HBV infections, predating even the appearance of symptoms in those patients who become clinically ill, it is the predictable appearance and disappearance of other HBV-associated antigens and antibodies over time that allows patterns compatible with either acute or chronic infection to be described.

The complete hepatitis B viral particle, also known as the Dane particle, after Dane and co-workers who described it in 1970[17], consists of the viral core surrounded by its HBsAg-rich envelope. If the envelope is removed by the use of detergents *in vitro*, a viral core antigen (HBcAg) can be identified. Unlike HBsAg, HBcAg does not circulate freely in serum and is found in blood only as an integral component of the internal viral nucleocapsid[17]. A third antigen, the e antigen (HBeAg), is serologically distinct from both HBsAg and HBcAg. HBeAg is associated primarily with the core antigen in the virus' internal structure, but unlike HBcAg, it can be found circulating in serum, frequently in complexes with immunoglobulin.[18] All three serologically unique antigens stimulate the production of equally distinct antibodies (HBsAb, HBcAb, and HBeAb) in the course of non chronic host infection.

The presence of HBeAg has been closely correlated with both the infectivity of a particular patient's serum and the microscopic detection in serum of the HBV virus itself [19, 20], and an increased risk for chronic liver disease[21, 22]. Seropositivity for HBeAg is taken as a marker of active viral replication and the most infectious phase of the disease, either in acute or in chronic illness. Practically, however, HBsAg is used in screening protocols because of the high concentrations of this antigen produced in response to viral presence and replication. More vigorous HBV serologic testing is performed, along with liver function evaluation, in HBsAg-positive individuals, both symptomatic and asymptomatic, to characterize the nature and extent of their disease. The appearance of HBsAb in the serum of patients occurs in the setting of resolution of acute infection; it is this antibody that appears to confer protective immunity. However, both HBcAb and HBeAb have been shown experimentally to be protective against reinfection [23,24,25,26].

Prevalence

The prevalence of HBV infection, according to the geographical area, may be high (≥8%), intermediate (2-7%), or low (≤2%) [3]. Nigeria is classified among the countries highly endemic for viral hepatitis[4]. The prevalence of HB s Ag in normal population in Nigeria ranges from 2.7% to 13.3%[5, 6]

Viral hepatitis infection remains a public health problem in developing countries. A 12.3% overall prevalence for HBsAg in pregnant women attending antenatal clinic at General Hospital Minna has been reported[66]. This was a descriptive cross-sectional study using 261 pregnant women to determine social characteristics and seroprevalence of hepatitis B

virus. This also corroborates the World Health Organization (WHO, 1990) report for Nigeria as a highly endemic area with prevalence greater than 8%. In related studies in different parts of Nigeria, higher prevalence rates of 11.6% were reported among pregnant women in including 2.19 % in Benin City [64], 4.3% in Port Harcourt in 2005 and 2.89% in 2006[65].

There is a relatively higher hepatitis B virus infection rate in patients co-infected with HIV. Agbaji et al[67] carried a cross sectional study in Jos amongst 1042 HIV positive patients and reported that hepatitis B co- infection was found to be 14.2% amongst females and 19.4% amongst male in the study. Sirisena et al[68] quoted a higher co infection rate of 28.7% in an earlier study

Manifestation of Hepatitis B Infection in the Host

This can be either an acute infection (which invariably occurs during pregnancy in a previously otherwise normal person), or a chronic infection (which is usually preexistent in either overt or latent form and with pregnancy occurring later)

Acute Hepatitis:

Hepatitis B infection does not have any special predilection for pregnancy[12, 13]. In a study of acute viral hepatitis in pregnancy from North India, HBV infection was observed in 19% and 18% of the pregnant and nonpregnant females respectively[13]. Moreover, acute HBV infection is not more severe in pregnant women than in non pregnant individuals[12, 14].

The presentation, as a rule, does not differ from that in non pregnant women. Persons with overt acute viral hepatitis initially have non-specific complaints including fatigue, malaise, anorexia, nausea, headache, myalgia and low grade fever. The nausea and vomiting of prodromal stage may be confused with the symptoms present in pregnancy without hepatitis. If the illness resolves before there is sufficient liver cell injury and consequent secondary dysfunction to cause jaundice, these prodromal symptoms are passed off as a flu-like viral syndrome or even for the normal physiological effects of pregnancy itself. Otherwise, jaundice develops within 2 to 10 days of the prodrome. These patients may also complain of right upper quadrant discomfort and examination may reveal tender hepatomegaly[14]. Splenomegaly is noticed in about 10% of cases[14, 15]. In the later stages of pregnancy, the abdominal examination for hepatosplenomegaly may be difficult. Most often, jaundice and symptoms of liver disease resolve in 6 weeks[14]. Some of them have a violent course resulting in fulminant hepatic failure with features of cerebral edema, coagulopathy, multiple organ system failure and a few others have a persistent course beyond 6 months to result in chronic hepatitis[14, 15].

Acute hepatitis, particularly late in pregnancy, may induce premature labour, but this seems to have little adverse effect on the foetus.[13] Heiber et al[14] have also noticed an increase in the incidence of prematurity (31.6%) over that seen in the general delivery population (10-11%). Apart from this, there are possibilities of intrapartum or postpartum hemorrhage, especially if the prothrombin time is prolonged as in fulminant hepatic failure[13]. The usual hematologic examinations are unremarkable. The aminotransferases are high even if the bilirubin is normal (as in anicteric hepatitis) [13]. The viral markers like HBsAg and IgM Anti-HBc are helpful in diagnosing acute hepatitis due to HBV[13].

Chronic Hepatitis and Cirrhosis

In most affected individuals, chronic viral hepatitis is asymptomatic either indefinitely or until there is sufficient liver damage for the patient to develop manifestations of end-stage liver disease[16]. Many cases of chronic viral hepatitis are therefore diagnosed after serum transaminase levels are incidentally noted to be abnormal[16]. This commonly occurs, when an apparently healthy young woman becomes pregnant and consults an obstetrician. Apart from the abnormal transaminase, the other investigations are usually normal unless the liver disease is severe[16]. Patients with severe chronic hepatitis are usually aware of the liver problem before deciding about conception. In cirrhosis, the situation is slightly different; fertility is decreased probably due to amenorrhea and non-ovulating cycles, and hence pregnancy is less often seen in them.

Physical examination may be normal or the patient may have subtle physical findings consistent with early cirrhosis, including palmer erythema, splenomegaly, and a small liver (sometimes with enlargement of the left lobe). Palmer erythema, if present, may be confused with that of pregnancy (physiological). Examination of the abdomen is difficult and may be ambiguous in the later stages of pregnancy, when the liver and spleen are not palpable. In a minority of patients with end-stage liver disease, clinical features of liver failure gradually becomes apparent and may be mistaken for a hepatic complication of pregnancy[16].

Chronic HBV carriers usually have normal pregnancies, unless there is severe chronic hepatitis or secondary cirrhosis and associated complications.[16] Infeld et al had reported pregnancies in at least 28 of mild chronic hepatitis patients without any harmful maternal effects[17]. In cirrhotics, the main maternal risk is related to the degree of portal hypertension and the likelihood of esophageal variceal haemorrhage[18,19]. The onset of labour increases the intraabdominal pressure thereby increasing the chances of variceal bleeding. Besides this, the deterioration of hepatic function also occurs. Liver and renal failures are the other causes of maternal mortality [16]

Management of Acute Viral Hepatitis

The management is similar to that for non pregnant state. The management, like in a non-pregnant state consists of supportive measures like high calorie diet, bed rest and vitamins[15]. If marked anorexia or vomiting is present hospitalization may be required for intravenous fluid administration[15]. There is no recommended antiviral therapy for acute viral hepatitis because most adults clear the infection spontaneously[15]. Early antiviral treatment may only be required in the 1-2% of patients with fulminant hepatitis and those who are immunocompromised[15].

Management of Chronic Liver Disease and Cirrhosis

Treatment of chronic infection may be necessary to reduce the risk of cirrhosis and liver cancer[17,18]. Supportive management of liver disease is similar to that in the non pregnant state. There are no dietary restrictions unless cirrhosis with complications has set in[17]. Management of esophageal varices needs special attention by way of prophylactic banding[17]. Use of pharmacoprophylaxis for bleeding requires very careful monitoring of the haemodynamic status[18]. Coagulopathy should be managed with administration of fresh frozen plasma.

Antiviral therapy is considered as applicable to non pregnant state. Of the three recommended available drugs for chronic hepatitis B, interferon alpha is not used possibly due to lack of adequate controlled studies even though reports of its use in HCV infection does not show significant interferon related fetal malformation [20,21]. The safety of Adefovir, Dipivoxil in pregnancy has not been clearly established[22]. Only Lamivudine which is used in an oral dose of 100mg daily has been found to be safe and has been advocated for use in pregnancy[23].

Vertical Transmission and Effect on the Fetus

The significance of HBV infection during pregnancy derives in major part from its potential to be transmitted vertically [24]. Ten percent of infants born to women with acute HBV infection during the first trimester of pregnancy are HBsAg positive at birth[25] and 80 to 90% of neonates become HBsAg positive without prophylactic therapy if acute maternal infection develops during the third trimester of pregnancy[14,26]. This variable rate of vertical transmission from mothers with acute disease is explained by the fact that the placenta is a reasonably effective barrier to the spread of HBV infection[27,28]. According to Okada et al[27], 85% of neonatal HBV infections are caused by intrapartum exposure to infectious blood and vaginal secretion, and the remaining 15% by haematogenous transplacental viral spread. However, Zhang[28] in 2004 showed by measuring concentration of HBsAg & HBcAg in maternal decidual cells, trophoblastic cells, villous mesenchymal cells and villous capillary endothelial cells, that the main route of HBV transmission from mother to fetus is transplacental, from the mother's side of the placenta, to the fetal side. He also detected HBV DNA in amniotic fluid samples and vaginal secretion samples - emphasizing transmission of infection by these during parturition.

Okada et al[24], examined the newborn infants of 139 asymptomatic carriers and did not find HBsAg positivity in the cord blood at any of them. However, on follow up for more than seven months, eight of the 11 mother-child pairs tested showed antigenemia, the earliest appearing 5 days after delivery. The sub-type of HBsAg was identical for each mother-child pair. In the true sense, this could be an instance of horizontal transmission from the mother during the immediate post natal period. Subsequently Okada et al[27] showed that all babies born to e antigen positive mothers developed surface antigenemia. In contrast, all of the babies born to e antibody negative mothers escaped surface antigenemia. From this it is quite clear that e antigen positivity in the mother is a reliable marker to predict transmission of infection from mother to child. In the absence of appropriate prophylaxis, 40% of the neonates of HB e antigen negative mothers and 90% of the neonates of HB e antigen positive mothers will develop HBV infection.[27, 30] However Sinatra et al[29] reported that three infants born to anti-HB e positive mothers developed acute icteric hepatitis B within 3 months of birth. Liu et al[31] have demonstrated that HLA-DR3 is positively correlated with chronic HBV carriage and highly replicative status in pregnant women. HLA-DR13 shows negative correlation with chronic HBV carriage in pregnant women.

The strong possibility of vertical transmission lends importance to diagnosing acute or chronic HBV infection in pregnant women and justifies mandatory ante partum serum HBsAg screening[32]. By doing so, previously unsuspected chronic HBV infection is diagnosed in otherwise healthy individuals. This has the added benefit of making it possible to refer them for appropriate antiviral therapy before development of significant liver damage and associated functional insufficiency.

The infants of potentially infectious mothers are treated with HBV Human Hyper globulin (HBIG) at delivery and simultaneously active immunoprophylaxis is initiated[32]. This approach is effective in preventing chronic HBV in approximately 85% neonates[33]; it is ineffective in cases of haematogenous transplacental infection (15%)[34].

Different measures have to be adopted to modify (interrupt) the vertical transmission of HBV Infection.

HBIG – HBIG can be administered a dose of 200 IU i.m. every week from 28th week of gestation reduces the intrauterine infection to 16.1% against 32.7% (in controls).[34]

Lamivudine - Lamivudine has been used with good safety and efficacy in the last four weeks of pregnancy to decrease the risks of vertical transmission[35]. Li et al[34] showed that the intrauterine infection was reduced to 16.3% against 32.7% (controls) with its use from 28th week of gestation in a dose of 100mg/day. This is also substantiated by other studies[23]. However, there is a report of failure of vertical transmission of hepatitis B virus despite antenatal Lamivudine therapy[36]. Of course, in this case, the authors detected precore mutant in both the mother and the child and this is to be interpreted appropriately without undermining the vertical transmission lowering effect of Lamivudine.

Caesarean-section does not show any extra reduction in the incidence of vertical transmission in comparison to vaginal delivery[37]. Apart from vertical transmission, the maternal HBV infection does not have any effect on the fetal outcome[37]. Although there was an increase in incidence of prematurity, it had no effect on congenital malformations, stillbirths, abortions or intrauterine malnutrition in comparison to the controls[14].

Breastfeeding

Breast feeding is an important outcome of pregnancy and successful delivery. So, once the HBV infected mother, with all possible precautions delivers a baby without any evidence of infection at birth, the next question that comes to mind is: whether breast feeding can be done safely? Even though, breast milk of infected mother contains HBV DNA, with appropriate immunoprophylaxis, including hepatitis B immunoglobulin and hepatitis B vaccine, breast feeding of infants of chronic HBV carriers (irrespective of replicative status) poses no additional risk for the transmission of the hepatitis B virus[38].

Prevention

Mothers positive for both HBsAg and HBeAg are at highest risk for transmitting the virus; 85% to 100% of their offspring become infected, with 70% to 90% becoming chronic carriers[37]. Mothers who are HBsAg-positive but HBeAg-negative, presumably indicating lower levels of replicating virus, do have a lower risk of transmitting the virus, but up to 35% of their children still will become carriers in the absence of neonatal therapy.[39,40,41,42]. In addition to the long-term risks of HBV-related sequelae in chronic carriers, such as cirrhosis and hepatocellular carcinoma, both fulminant fetal neonatal hepatitis [43, 44, 45], and childhood-onset hepatic carcinoma[46] have been described in children born to HBsAg-positive mothers.

Early attempts at interrupting the perinatal transmission cycle used HBIG alone, administered in the neonatal period. Globulin alone had a protective efficacy against the carrier state of 70% to 75%, even though the protection was not permanent, and many children eventually became infected after the passively acquired antibody was cleared, undoubtedly through household contact[46]. With the advent of the hepatitis B vaccine, trials were established to test its efficacy when administered in the newborn period, both alone and in conjunction with HBIG[41]. A combination of HBIG and vaccine in the newborn period conferred significantly greater protection against perinatally transmitted HBV than even the vaccine alone, increasing efficacy from a range of 75% to 85% up to 90% to 95%[,42,47,48,49,50,51,52,53,54,55]. A small but identifiable percentage of babies, who become infected despite even combined HBV therapy at birth, is believed to represent intrauterine infection[55, 56].

HBV DNA has been identified in abortus tissue extracted from an HBsAg-positive mother [57], and other reports show evidence of intrauterine infection in clinical situations, increasing risks for transplacental leakage, such as preterm labour associated with placental abruption[55,56]. Still, combination HBV-specific immunotherapy provides the best opportunity to prevent the chronic carrier state in the offspring of HBsAg-positive mothers[37]. In the United States alone, approximately 16,500 births occur in HBsAg-positive women each year, approximately 4300 of whom are also HBeAg-positive[58]. Infants born to these women should receive HBIG (0.5 ml) intramuscularly (IM), ideally within 12 hours of birth[59]. HBV vaccine should be administered concurrently at a different site (0.5 ml IM) or can be administered up to 7 days after birth if it is not immediately available[59]. The timing of HBIG appears to be more critical than that of vaccine in achieving maximal effectiveness of passive–active therapy. Subsequent vaccination is performed, also 0.5 ml IM, at ages 1 month and 6 months[59]. Follow-up for these infants is crucial, because one recent study confirms the concern that in the United States, groups at highest risk for HBV infection are also least likely to be compliant with follow-up care. It is the recommendation of the American College of Obstetricians and Gynecologists that HBsAg screening be performed as part of routine prenatal testing in all pregnant women[32].

MATERIAL AND METHOD

Study Area.

This study was carried out in the maternity unit of the Department of Obstetrics and Gynaecology, Jos University Teaching Hospital (JUTH) Jos. Jos University Teaching Hospital (JUTH) is a tertiary health institution situated in Jos. It is one of the two teaching hospitals in the north-central geopolitical zone of Nigeria, although there are Federal Medical Centres (FMCs) in the other states within the geo-

political zone. Jos is the capital city of Plateau State, which has over 30 different ethnic groups [11].

The 2006 Nigerian census puts the population of Plateau State at 2,959,588 with 1,031,662 being female[11].

Plateau State lies between latitude 7^0 and 11^0 North and Longitude 70^0 and 250^0 east[11]. The capital city is a pear-shaped upland known as Jos Plateau. This upland stretches for approximately 104km from north to south, and 80km from east to west, covering an area of about 8,600 sq km[11]. It has a height of 1,200m above sea level[11]. Jos University Teaching Hospital has recently re-located to its permanent site at Laminga, Jos North Local Government Area of the State capital, in North central Nigeria. The hospital has a well established Obstetrics and Gynaecology Department.

Study Population

The study population were women who present in labour at the labour ward of Jos University Teaching Hospital, North Central, Nigeria

Study Design

The study is a descriptive cross-sectional study and hospital based. It was conducted between 1st March, 2011 and 31st August ,2011. The parturients who give an informed consent were recruited to the study during the last 5 weeks of pregnancy and the pre–structured questionnaires were administered. As the women came in labour, blood samples were taken from the ante-cubital vein. Cord blood was also collected at delivery of the baby after cutting the umbilical cord

Inclusion Criteria

1. Pregnant women who gave informed consent and who presented in Labour at the labour ward of JUTH for delivery and met the criteria.

Exclusion Criteria

1. Women who were not pregnant
2. Pregnant women who have had hepatitis B immunization
3. Pregnant women who were HIV positive
4. Pregnant women who declined to participate in the study.

Ethical Consideration

This proposal was presented to the research and ethical committee of Jos University Teaching Hospital for approval. Informed consents were obtained from the subjects before enlistment into the study.

Estimate of Sample Size

The sample size was calculated using the formula[60]
$N=z^2 pq/d^2$

Where,
N= desired sample size
Z=standard normal deviate 1.96 which correspond to 95% confidence interval.
P= prevalence expressed as 100% that is, 13.3%[5]
q=complimentary proportion 1-p
d=degree of accuracy desired=0.05

$$N=\frac{(1.96)^2 \times 0.133 \times 0.867}{(0.05)^2}$$

=177.2

A minimum of 180 pregnant women were recruited for the study.

Data Collection

Collection Of Blood Sample /Serum Preparation

Blood samples were collected aseptically by venepuncture using 5 ml sterile disposable hypodermic syringes and needles from the ante-cubital vein of pregnant women who presented in labour in the labour ward of Jos University Teaching Hospital. The blood samples collected were dispensed into pre-labeled specimen bottles. The samples were allowed to clot and centrifuged at 3,000 rpm for 5mins to separate the serum. The sera were extracted using micropipette and testing carried out as explained below

Procedure for Detecting HB s Ag

Hepatitis B surface antigen (HBsAg) detection was done using the in vitro diagnostic kit manufactured by ACON Laboratories, Inc. ,4108 Sorrento Valley Blvd., San Diego, CA 92121, USA. The test kit (dipsticks) is a rapid immunochromatographic assay designed for qualitative determination of HBsAg in human serum or plasma. Assays were carried out at room temperature. The test strips were removed from their foil pouches and immersed into serum samples with arrows pointing towards the samples. The strips were taken out after about 10secs and placed on a clean, dry, non-absorbent surface. This was to allow time for the reaction to take place. The specimen was absorbed into the test strips and moved by capillary action upward towards the control line. Results were read after 10mins post immersion. Positive samples generated a colour band in the test region of the strips and another in the control region while negative samples had a colour band in the control regions only.

Procedure for Detecting HB e Ag

Sample positive for hepatitis B surface antigen were tested for hepatitis B e antigen to determine infectivity using CTK ONSITE test kit manufactured by CTK Biotech, Inc. 6748 Nancy Ridge Drive, San Diego, CA 92121, USA. 2-3 drops of plasma were dropped in the test kit well using a small plastic dropper. Results were read after 15 minutes. There are C and T bands on the test kit. The test is positive if C and T bands show colour development and is negative if only C band shows colour development. Mothers who are positive for hepatitis B surface antigen shall have the cord blood of their babies also similarly tested.
Positive samples were stored at -20^{0}C and were later confirmed by using a commercially prepared recombinant antigen-based Enzyme Linked Immunosolvent Assay (ELISA) test. This was done at the Immunology Laboratory of the Jos University Teaching Hospital, Jos.

Statistical Methods for Data Analysis

The results are expressed as means, and standard deviation. Chi square was used to determine significance of association. The relationship between HB s Ag and other variables in the questionnaire were examined using P values. Significance was determined using P<0.05 at 95% confidence interval. All analysis were conducted using the SPSS version 15 software.

Limitation to the Study

1. One of the limitations was poor knowledge of the disease entity and the myth surrounding Hepatitis B virus infection which affected consent
2. Repeat testing of the positive infants at 3 months, 6 months and at 12 months would been necessary to ascertain the actual mother to child transmission. This would be the basis for future studies
3. Other hepatitis B markers like Anti HBc, Anti HBs and Anti HBe would have been done to enable proper classification of patients. However, cost of testing for all the markers is high and therefore, a serious challenge.

The Benefits of the Study

This study will benefit both patients and humanity

Patient

The opportunity to have serum hepatitis B surface antigen test done free –of- charge for these patients by the researcher.
Arrangement was made for immunization of those mothers who are negative after weaning for them to be immunized and arrangement was also made for co-administration of hepatitis B immunoglobulin and passive hepatitis B immunization to those babies born to hepatitis B s antigen positive mothers. Another benefit to the patient is that those who participated in the study were provided with free haematinics for 6 weeks by the researcher.

Humanity

The result of the study will assist in policy formulation in assessing the current non -screening of women for hepatitis B surface antigen during ANC booking.

RESULTS

Tables 1, 2, 3, 4 and 5 show the age distribution, educational status of mother, occupation of mother, educational status of father and occupation of father. The analysis did not show any statistically significant association between the above socio-demographic variables and the seropositivity of HB ' s'Ag. P values >0.05
Table 6 shows the gravidity of the participants and serostatus. Also no statistically significant association was found between gravidity and HB ' s' Ag. X^2=2.266, P value=0.519
Table 7 shows history of blood transfusion and HB ' s' Ag. Sero status of the 180 enrollee in the study, 8 had history of blood transfusion. One in the eight with history of blood transfusion was HB ' s' Ag. positive. Again this was not statistically significant. X^2= 0.209, P value= 0.648
Table 8 compares the mean gestational age at delivery between the seropositive and the seronegative participants. Their mean gestational age was not statistically significantly different. P value=0.621
Table 9 shows the prevalence of HB ' s' Ag. in the 180 study participant of 12.77%.
Table 10 shows the prevalence of HB e Ag in the 180 study participant of 1.7%.
Table 11 shows the prevalence of HB ' s' Ag. in the cord blood of babies of the 180 participant of 2.2%.
Table 12 shows the cross tabulation of the maternal HB ' s' Ag. and cord HB ' s' Ag. Association was statistically significant. X^2= 12.346, P value= 0.000
Table 13 shows the cross tabulation of the maternal HB ' s' Ag. and maternal HB e Ag. In the general study population of 180, 3 (1.67%) tested positive for HB e Ag. That is 3 in the 23 that tested positive for HB ' s' Ag. That is proportion of 23:3 or 13.04%. Association was statistically significant, X^2=13.346, P value=0.000
Table 14 shows the cord HB s Ag and cord HB e Ag of babies of participants. Of the 4 cord blood that tested positive for HB ' s' Ag., none was positive for HB e Ag.

TABLE 1: Age Distribution and Elisa Hepatitis B Surface Antigen Status (Hb B 's'Ag)

	Serostatus	Hb B 's' Ag. Positive	Hb B 's'Ag. Negative	Total
Age	18-23 yrs	5	14	18
	24-29 yrs	12	72	84
	30-35 yrs	3	61	84
	36-45 yrs	3	10	13
	Total	**23**	**157**	**180**

X^2=6.932, P Value=0.074

TABLE 2: Educational Status of the Mother and Elisa Hepatitis B Surface Antigen Status (Hb B 's'Ag)

	Status	Hb B 's'Ag. Positive	Hb B 's' Ag. Negative	Total
Education	Primary	3	6	9
	Secondary	9	71	80
	Tertiary	10	78	88
	None	1	2	3
	Total	**23**	**157**	**180**

X^2=3.430, P value=0.329

TABLE 3: Occupation and Maternal Elisa Hepatitis B Surface Antigen Status (Hb B 'S' Ag)

	Status	Hb B 's'Ag. Positive	Hb B 's'Ag. Negative	Total
Occupation	Civil / public servant	7	44	51
	Business women	6	24	30
	Artisan	2	13	15
	Student & corpers	1	23	24
	Farmer	0	24	24
	Housewives	7	53	60
	Total	**23**	**157**	**180**

X^2=3.543, P Value=0.320

TABLE 4: Educational Status of the Father and Maternal Elisa Hepatitis B Surface Antigen Status (HB 's'Ag)

	Status	HB's'Ag. Positive	HB's'Ag. Negative	Total
Education	Primary	3	6	9
	Secondary	8	56	64
	Tertiary	12	93	105
	None	0	2	2
	Total	**23**	**157**	**180**

X^2=2.523, P value=0.471

TABLE 5: Occupation of the Father and Maternal Elisa Hepatitis B Surface Antigen Status (HB's'Ag)

	Status	HB's'Ag. Positive	HB's'Ag. Negative	Total
Occupation	Civil / public servant	11	80	91
	Business man	8	52	60
	Artisan	4	15	19
	Student & corpers	0	3	3
	Farmer	0	6	6
	Unemployed	0	1	1
	Total	**23**	**157**	**180**

X^2=2.186, P Value=0.823

TABLE 6: Gravidity and Elisa Hepatitis B Surface Antigen Status (HB 's' Ag)

	STATUS	HB's'Ag. Positive	HB's'Ag. Negative	Total
GRAVIDITY	Primigravidae	8	52	60
	Secundigravidae	8	40	48
	Multigravidae	7	47	54
	Grandmultigravidae	0	18	18
	Total	**23**	**157**	**180**

X^2=2.266, P value=0.519

TABLE 7: History of Blood Transfusion and Elisa Hepatitis B Surface Antigen Status (HB's'Ag)

	STATUS	HB 's' Ag. Positive	HB's'Ag. Negative	Total
BLOOD TRANSFUSION	**YES**	1	7	8
	NO	22	150	172
	TOTAL	**23**	**157**	**180**

X^2=0.209, P Value=0.648

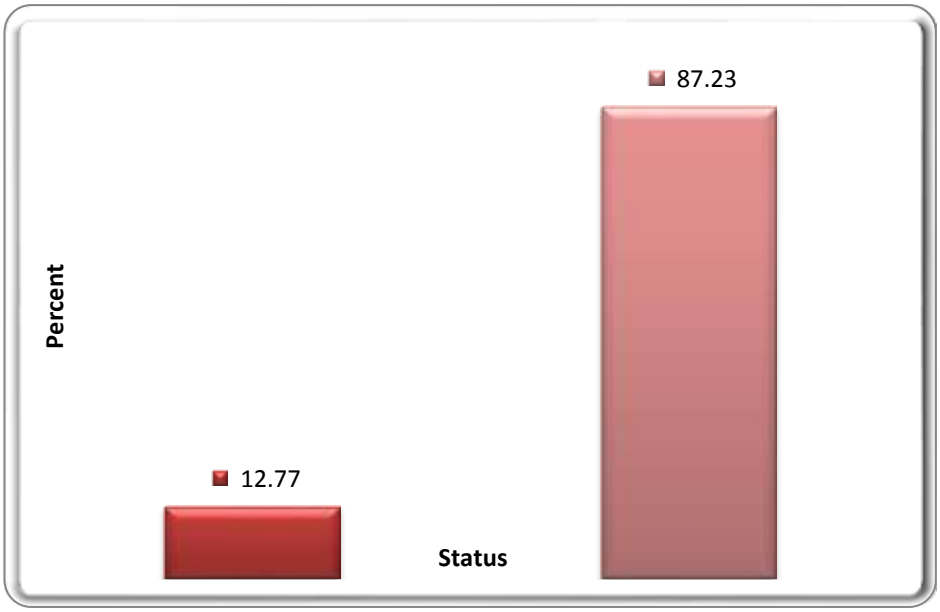
TABLE 8: Elisa Hepatitis B Surface Antigen Status (HB's'Ag) and Mean Gestational Age at Delivery (days).

		Number	Mean gestational age	Stand. Dev.	S.E of Mean
Status	Positive	23	271.2500	8.948	2.237
	Negative	157	272.4381	8.926	0.871

P=0.621

TABLE 9: Elisa Maternal Hepatitis B Surface Antigen Status (HB's'Ag)

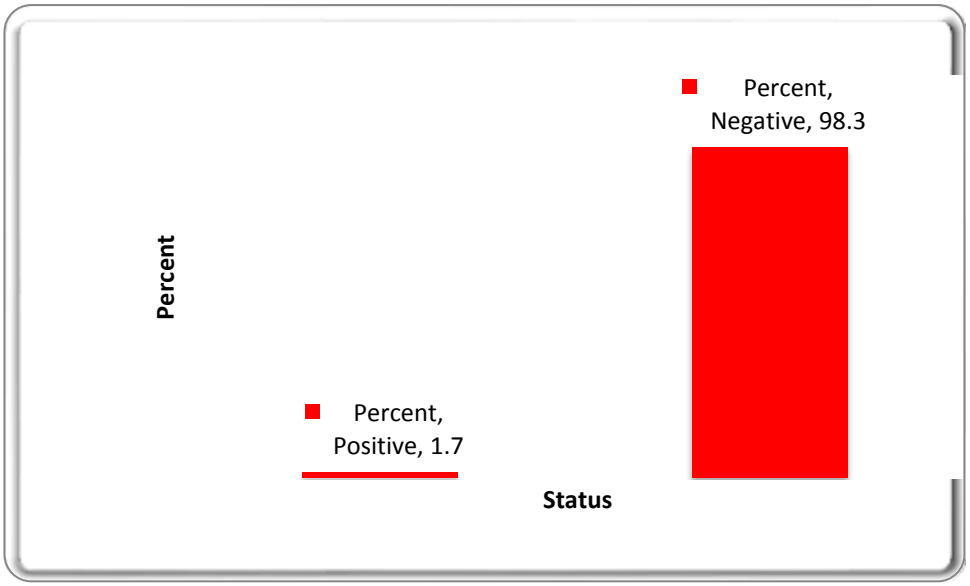
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Status	**Positive**	23	**12.77**	12.77	12.77
	Negative	157	87.23	87.23	100.0
	Total	18O	100.0	100.0	



Bar Chart 1: Showing Maternal Hepatitis B Surface Antigen Serostatus (HB 's' Ag) - Prevalence

TABLE 10: Maternal Elisa Hepatitis B 'E' Antigen Status (HB 'e'Ag)- Prevalence

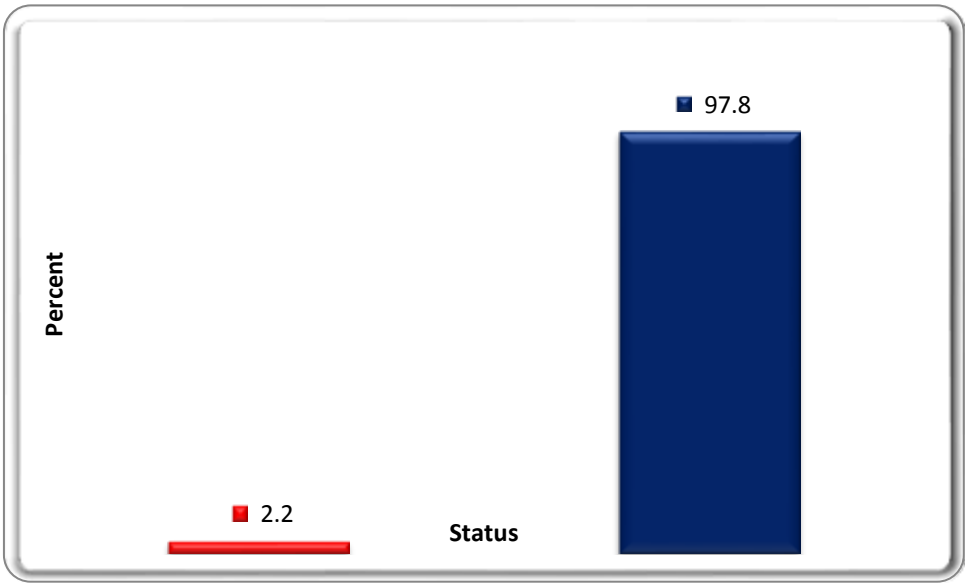
		Frequency	Percent	Valid Percent	Cumulative Percent
Sero status	Positive	3	**1.7**	1.7	1.7
	Negative	177	98.3	98.3	100.0
	Total	180	100.0	100.0	



BAR CHART 2: Showing Maternal Elisa Hepatitis B 'E' Antigen Status (HB 'e' Ag) - Prevalence

TABLE 11: Cord Elisa Hepatitis B Surface Antigen Status (HB 's'Ag) - Prevalence.

		Frequency	Percent	Valid Percent	Cumulative Percent
Sero-status	**Positive**	4	**2.2**	2.2	2.2
	Negative	176	97.8	97.8	100.0
	Total	180	100.0	100.0	



Bar Chart 3: Showing Elisa Cord Hepatitis B Surface Antigen Status (HbB 's' Ag)

TABLE 12: Elisa Maternal Hepatitis B Surface Antigen Status (HB 's' Ag) and Cord Hepatitis B 'S' Antigen (HB 's' Ag)

	CORD HB 's' .Ag	POSITIVE, (%)	NEGATIVE, (%)	TOTAL
MATERNAL HB 's' .Ag	POSITIVE	4, (17.39%)	19, (82.61)	23
	NEGATIVE	0, (0%)	157, (100%)	157
	TOTAL	4, (2.22%)	176, (97.78%)	180

X^2=12.346, P value= 0.000

TABLE 13: Elisa Maternal Hepatitis B Surface Antigen Status (HB 's' Ag) and Hepatitis B 'E' Antigen (HB 'e'Ag)

	H B 'e' .Ag	POSITIVE, (%)	NEGATIVE, (%)	TOTAL
HB 's' .Ag	POSITIVE	3, (**13.04%**)	20, (86.96%)	23
	NEGATIVE	0, (0%)	157, (100%)	157
	TOTAL	3, (1.67%)	177, (98.33%)	180

X^2=13.346, P value= 0.000

TABLE 14: Cord Hepatitis B Surface Antigen Serostatus (HB's' Ag) and Hepatitis B 'E' Antigen (HB 'e'Ag)

	HB 'e'. Ag	POSITIVE	NEGATIVE	TOTAL
HB 's' .Ag	POSITIVE	0	4	4
	NEGATIVE	0	176	176
	TOTAL	0	180	180

DISCUSSION

This study was undertaken to find out the prevalence of HB ' s'Ag. among women at delivery and to assay the above marker in the respective cord bloods of their babies. Secondly, it is find the proportion of HB ' s'Ag Positive women that are HB 'e' Ag positive and also, to document same proportion in the cord bloods of their babies. Hepatitis B, a viral liver infection remains a public health problem in developing countries with high endemicity.

A prevalence rate of 12.77% for HB's'Ag was found in this study. This finding makes Jos an area of high endemicity[3] for hepatitis B virus. This prevalence rate compares to a rate of 12.6% by Jombo et al (2005) in prevalence study of hepatitis B virus infection in a rural settlement in Northern Nigeria[69]. Also in the same north central Nigeria, Mbaawuaga et al, (2008) find a prevalence of 11% in a study in Markudi, Nigeria involving 300 pregnant women[70]. Similar prevalence rates have been reported, 11.6% in Maiduguri, north eastern Nigeria[61] and 13.8% in Lagos, south-western Nigeria. But lower prevalence rates have been reported from studies in the southern part of the Nigeria, 2.19% in Benin City[64], and 4.3% in Port Harcourt[65]. Agbaji et al (2008) in a cross sectional study in Jos, Nigeria among 1042 HIV positive patients report a prevalence of HB ' s'Ag of 14.2% among the female and 19.4% among the males in the study[67]. Also in a similar study Sirisena et al (2002) quoted a higher co- infection prevalence rate of 28.7%[68]. But these were studies among HIV positive participants and studies have shown that prevalence of HB ' s'Ag is higher amongst HIV positive patients[67, 68]. In this study, the researcher excluded HIV positive women.

Prevalence rate of cord HB's'Ag of 2.2% was found in this study. Of the 23 women that tested positive to HB's'Ag, 4 (17.4%) had their respective cord blood also positive for HB's'Ag. Though studies assessing the cord blood seropositivity for HB ' s'Ag at delivery in this part of the world is scarce, intrauterine infection though said to be rare is known to occur[27, 28]. Rates as low as 2.5% for mother-to- child transmission of hepatitis B infection prenatally, has been[70]. At delivery, cord blood of babies from HB ' s' Ag positive mothers have been found to be positive in up to 50% of cases[7]. This is however higher than the 17.4% that was found in this particular study. Ameer et al, (2007) found out that of the 300 women that enrolled in their study, 37 were positive for HB ' s' Ag (12.33%). Cord blood was positive for HB ' s'Ag in 4 out of the 37 HB ' s' Ag positive women (that is 10.8%). Differences in the conduct of labour and delivery, and differences in transplacental transfer of infection, possibility of delayed sero-conversion could account for the variance. Whatever the reason for the difference, it is however shown that intrauterine or rather prenatal transmission making the cord blood to become positive do occur. Zuberi et al, (1989) reported a similar low vertical transmission[72].

The study also revealed that of the 23 women that were HB ' s' Ag positive, 3 were HB 'e' Ag positive. Thus giving a proportion of 23:3 or 13.04%, the prevalence rate for HB 'e' Ag in the study population of 1.7%. HB 'e'Ag is the marker for infectivity. Being HB 's'Ag positive has a highly statistically significant association with being HB 'e'Ag positive. X^2= 13.346, P value= 0.000. Ameer et al, (2007) found that HB e Ag was positive in 40.54% of patient that were HB s Ag positive[71]. This does not compare to the 13.04% found in this study.

This study showed that of the 4 babies whose cord bloods were positive for HB S Ag, none tested positive to HB 'e'Ag. Ameer et al (2007) find that 75% of cord bloods that were HB s Ag positive were also HB e Ag positive[71]. The difference could be due to the natural history of the disease.

CONCLUSION

The results of the study showed that the prevalence of HB s Ag among women at delivery in Jos metropolis is 12.77%. It also revealed that the prevalence of HB s Ag on cord blood is 2.2% which is an issue of concern. It also revealed that the Proportion of HB s Ag to HB e Ag in women at delivery is 23:3. This means that 13.04% of those that were HB s Ag positive were infectious. Association was statistically significant. There was no HB e Ag positivity in all the 4 cord blood that was HB s Ag positive.

Recommendations

Following this study, it is recommended that:

In line with WHO recommendation of routine antenatal screening for HB's'Ag. For pregnant women at booking[2], it recommended based on the finding of this study that routine screening for HB S Ag on all pregnant women be introduced at the booking clinic. This will help identify those that are positive. In this particular group further measures or interventions to protect the unborn babies can be taken

Also government and non-governmental agencies should intensify efforts to enlighten the public in general and those within the reproductive age group in particular of the public health importance of the disease

A larger multicentre study design to follow up babies born to mothers that are HB S Ag for 6 and 12 months is also recommended so as to ascertain both horizontal and vertical transmission of hepatitis B virus.

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