Congenital malaria and viral infections among mothers and their new born babies in University of Port Harcourt Teaching Hospital, Port Harcourt, Nigeria.

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Abstract: Infectious diseases are of primary concern to public health particularly in pregnancy because of the risk of transmission to the foetus. Several infections have been demonstrated to be transmitted from the mother to the child either during pregnancy or at the time of delivery through the birth canal. Malaria in pregnancy have been implicated in low birth weight, increased infant and maternal mortality. Co-infection of malaria with viral infections predisposes the pregnant woman to greater risk. The study was aimed at evaluating the prevalence of malaria and viral infections amongst mothers and their new born babies in University of Port Harcourt Teaching Hospital, Port Harcourt. Study was conducted in postpartum women in University of Port Harcourt Teaching Hospital. Venous blood was collected from 103 mothers and from the umbilical cord of their babies. Blood smears were stained with Giemsa and diagnosis of malaria was done by microscopy. Using the sera from the collected blood samples, analyses were done for the presence of HCV and HbsAg antibodies using ELISA techniques while a point of care test was used for the analysis of HIV antibody. Transmission of the infections was evaluated based on the presence of the pathogens in cord blood of the new born babies. Evaluation of the results showed as follows: Malaria parasites were found present in all the mothers (100%), HIV (7.7%), HbsAg (1.9%) and HCV (0.97%) respectively. Transmission for malaria parasite was 96%, HIV (62.5%) and there were no transmission for the HBV and HCV antibodies. Obvious very high transmission of malaria and HIV. There is a great need to enforce PMTCT and IPTp in the study area.

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Key words: malaria, viral infections, mothers, new-born babies.

1. Introduction

Infectious diseases are of primary concern to health particularly in pregnancy because of the risk of transmission to the foetus. Several infections have been demonstrated to be transmitted from the mother to the child either during pregnancy or at the time of delivery through the birth canal. The pathogens frequently responsible for these infections span from viral, bacteria, parasitic and other organisms. Commonly implicated pathogens are viral infections (HIV, Hepatitis B, C and E, Cytomegalovirus, herpes simplex), bacterial infections (gonorrhoea, syphilis) and parasitic infections such as malaria, (Ford-Jones, 1999). Reports have shown that many pathogens such as viruses and bacteria infect and cross the placenta and subsequently invade the tissues and organs of the foetus (Taylor & Francis, 2001). Pathogens like HIV can be transmitted in utero as well as perinatally while hepatitis B and herpes simplex can cross placenta and infect utero.

Many adverse effects such as stillbirth, preterm birth, low birth weight and spontaneous abortion have been associated with infections in pregnancy (Velu et al, 2011). Infections from mother to child could be either in utero (congenital), during delivery (perinatal) or during breastfeeding. The present study is centred on the congenital and perinatal infections.

Hepatitis B infection has become a major public health concern and indeed a global health problem. Statistical studies show that 2 million deaths worldwide is attributed to HBV infection which accounts for about 370 million chronic infection with 65 million of these cases residing in sub-Saharan Africa (Hwang and Cheung, 2011). Transmission from mother to child accounts for 50-60% of chronically infected persons (Dyson et al, 2014). Nigerian statistics infers a hyperendemic situation with a reported prevalence of 10% infection in Nigeria and a gradual decline over the past 13 years (Nna et al, 2014; Musa et al, 2015).

Infections of hepatitis C virus is not commonly reported as the hepatitis B yet it is one of the leading public health problems globally and it 4 times more infectious than HIV (Te et al, 2010). The WHO estimates that 170 million people are infected with the virus with the highest burden present in sub-Saharan Africa (WHO, 1999). Nigerian reports indicate an increasing prevalence from 4.7% in Ilorin to 20% in Benin (Ejiofor et al, 2010).

Co-infection of malaria with viral infections such as HIV predisposes the pregnant woman to increased risk of anaemia, preterm birth and growth retardation in the foetus (Bloland et al, 1995; Inion et al, 2003) because HIV increases the risk of placental malaria infection, high density parasitaemia and febrile illness (Desai et al, 2007). HIV infection reduces the ability of the pregnant women to control *P. falciparum* infection (Ter Kuile et al, 2004).

The malaria parasite Plasmodium is made up of 5 species (*P. falciparum, P. ovale, P. malariae, P. vivax and P. knwolesi*. Of all these, *Plasmodium falciparum* is the agent of the most malignant form of malaria, usually presenting with severity mostly in children and pregnant women in sub-Saharan Africa (Urdaneta et al., 2001). It is the most dangerous form of malaria with the highest rates of complications. It is also the commonest species in virtually all parts of Africa accounting for up to 98% of the confirmed cases in Nigeria and is associated with significant morbidity and mortality.

Malaria tends to affect mainly children and pregnant women due to low immunity in children as a result of fewer exposures and reduced immunity in pregnant women. Reports have shown prevalence of 32% in peripheral and 38.2% placental malaria among women attending antenatal clinics in East and Southern Africa (Chico, 2012). From studies in Sub-Saharan Africa where there is stable transmission, evidence has shown that 1 in every 4 pregnant women has evidence of peripheral or placental infection with malaria parasites and these placental infection seems to persist outside seasons of high infection (Desai, 2007). An estimated 6% of infant deaths in areas of malaria endemicity is attributed to malaria infection during the child's prenatal life (Fischer et al, 2003).

HIV is a major concern in pregnancy and has contributed to a large population of HIV children in sub-Saharan Africa. Nigeria bears the second highest burden of HIV globally with an estimated number of over million living with HIV (NACA, 2015). In settings as obtained in Nigeria, where heterosexual transmission is common, women are more likely to be affected in the epidemic thereby increasing the burden of mother to child transmission. The high prevalence of HIV in women of reproductive age has led to a growing population of HIV–infected and affected children, accounting for large number of children with HIV, Nigeria has the highest number (about 59,000) of new infections among children (UNAIDS, 2013). It is estimated that one HIV- positive child is born every five minutes, in Nigeria (Eneh, 2007).

2. Materials and Methods

Study was conducted in postpartum women in University of Port Harcourt Teaching Hospital, Port Harcourt between October and December 2004. The study was carried out in Port Harcourt, the capital of Rivers State Nigeria. It lies along the Bonny River in the Niger Delta 41 miles upstream from the Gulf of Guinea, rich in the nation's oil resources and it is the TREASURE BASE of the nation. The region is dotted with oil and gas activities which attract many foreigners and migrant workers and commercial sex workers follow the camp (Nwauche and Akani, 2006). These socio-economic conditions contribute to a very high seroprevalence of HIV infection (15.2%) compared to the national prevalence of 4.1% (NACA, 2015).

Malaria is holoendemic in Nigeria and transmission is all the year around with higher transmission during the rainy season. Port Harcourt exhibits lengthy and heavy rainy seasons and very short dry seasons with average temperatures between 25˚C-28˚C. Due to this vulnerability, there is an increased interaction with malaria which is already endemic in Nigeria especially in the Niger Delta as a result of its mangrove swamp forest vegetation where transmission is year round (PMI, 2011).

A total of one hundred and three paired blood samples were collected from post-partum mothers and the cord blood of their new-born babies for the study. Diagnosis of malaria was done using laboratory diagnosis based on microscopy. Thick blood films on microscope glass slides were made from blood smears obtained from the umbilical cord blood of the new-born babies and finger prick of the mothers. Freshly prepared 10% Giemsa stain was used to stain the blood smear on the slide for 10 minutes and allowed to dry. Using oil immersion, slides were viewed under the microscope at X100 lens. Parasite diagnosis and quantification was made based on the malaria plus system where the scoring scale ranges from 0 to ++++ (WHO, 1991). In this scaling system, 0 is scored where there is no parasite, + for 1-10 parasites per 100 high power field, ++ for 11-100 parasites per 100 high power field, +++ for 1-10 parasites per high power field and ++++ for over 10 parasites per high power field indicating increased parasitaemia density as you move up the scale.

HIV Screening was carried out using five millilitres (5mls) of blood was collected from each mother by venepuncture and 5mls of blood was

collected from the umbilical cord stump of her corresponding baby. Sera extracted from the collected blood samples from mothers and cord blood of the babies were screened and analysed by double ELISA techniques for the presence of HIV 1 and 2 in the Haematology department of the hospital. All the mothers delivered per vaginum.

Each blood sample was also screened for Hepatitis B Surface Antigen (HbsAg) as previously described (Ejele et al, 2005). Briefly described, using commercially available HbsAg test strips (Clinotech Diagnostics, Canada) a one-step strip for the qualitative detection of HbsAg, sera from mothers and cord blood were analysed for Hepatitis B surface antigen. Initially reactive samples were subsequently confirmed using a second generation Trinity, Biotec, Plc Ireland), an immunochromatographic method for the quantitative in vitro diagnosis of HBsAg.

Subsequently, Hepatitis C (HCV) screening was carried out using Clinotech anti-HCV test strips (Clinotech Diagnostics, Canada). Five millilitres of venous blood from mothers and cord blood from their babies were centrifuged. Sera was separated, aliquoted, labelled and stored at -20^{0}C prior to testing was done according to manufacturer's standard operating procedures. The test is used for qualitative detection of antibodies to HCV. Positive samples were subsequently tested using a second generation Trinity Biotech enzyme-linked immunosorbent assay kit (Trinity Biotec, Plc, Ireland), an immunochromatographic method a qualitative in vitro diagnostic test.

Finally, the ABO blood group screening was carried out based on previously described method using commercially prepared potent antisera (anti-A, anti-B and anti-D), Dacie and Lewis, 2001). Positive samples were identified by agglutination.

3. Results

The main observation from the results was the very high incidence of malaria parasites and the subsequent high transmission from mother to child. All the 103 samples from the mother's blood, were positive for *Plasmodium falciparum* by microscopy, none was negative. This high prevalence was equally observed among the new born babies, with 96% positive (99/103). On the other hand, the prevalence of HIV in these group of women was 7.7% (8/103) out of which five were transmitted to the new born babies, HbsAg was 1.97% while HCV was 0.97%. There was no presence of hepatitis B or C in the cord blood samples (Table 1).

Further analysis of the result for malaria parasitaemia, showed the degrees of parasitaemia in the samples from both the mothers and cord blood (Table 2).

Table 1. Frequency of the various infections

	MP	HIV	HBV	HCV
MOTHER	**103**	**8**	**2**	**1**
CORDBLD	**99**	**5**	**0**	**0**

Table 2. Degrees of malaria parasitaemia

	Mother	Cordblood
Degrees of parasitaemia		
+	**46**	**48**
++	**51**	**50**
+++	**6**	**1**
Total	**103**	**99**

Analyzing the relationship between Rhesus blood groups and Plasmodium parasitaemia using chi square, it was observed that samples with blood group O Rhesus positive had a higher prevalence of parasitaemia both in the mothers and the cord blood (p=0.000, Figure 1).

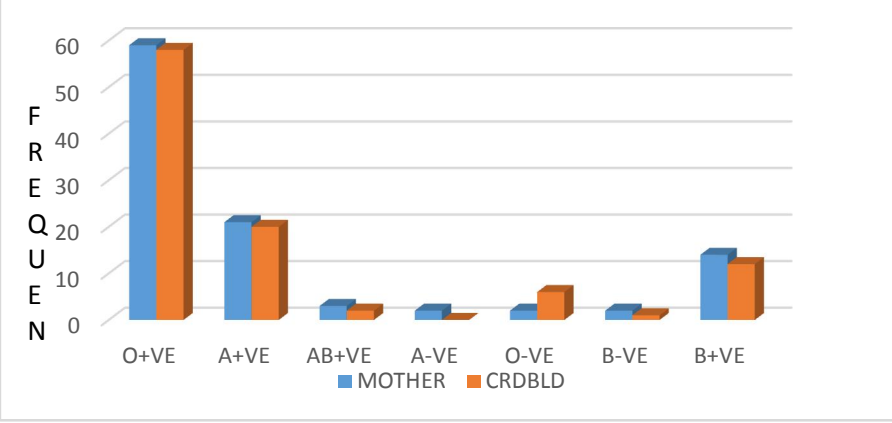

Fig. 1 Distribution of *Plasmodium* parasitaemia among the blood groups

There was mixed infection of HIV, HBV, HCV and malaria parasite in a mother's sample. It is noteworthy that there was only transmission of malaria parasite of the mother to the new-born baby.

4. Discussion

The study presented prevalence of malaria and some viral infections among postpartum mothers and their new-born babies. Top on the list is malaria parasites with a 100% prevalence in the mothers and just a little lower in the babies. The very high percentage of malaria parasites could be due to the fact that it was purely microscopy diagnosis. Using a more sensitive method like PCR may have given a different result. This method was beyond the scope of this study.

Relationship between malaria parasites and Rhesus blood group has long been established by many studies (Langhi et al, 2006; Cserti et al 2007). The higher prevalence in parasitaemia observed among the blood group O Rhesus positive samples is in consonance with earlier studies in literature (Singh et al, 2015; Chijioke-Nwauche et al, 2016).

Even though the number of HIV+positive mothers in the study sample is small, the transmission rate of 62.5% is quite alarming and much higher than the 15-45% that could be expected in the absence of any intervention (WHO, 2015). These results suggest that PMTCT was not adhered to by these mothers. PMTCT as a key factor reducing transmission of HIV from mother to child and has been reported to reduce transmission to as low as 2-5% (WHO, 2015). Poverty and ignorance have been implicated as part of the socio-cultural factors that affect non-compliance to PMTCT (Okoli & Lansdown, 2014). The National action against AIDS reports indicate that PMTCT programme was initiated in Nigeria in 2002 in six tertiary facilities and very few women were enrolled. Since then there has been consistent efforts to scale-up and expand the service to more women with a target to eliminate mother to child transmission in 2015 (NACA, 2015). However this target has not been met but it is still ongoing.

The low percentage of HBV as well as no transmission from mother to child is quite impressive considering the high prevalence of 10%. This could be due to the gradual declining rate and possibly increased awareness of the infection (Musa et al, 2015).

5. Conclusion

Results of this study indicate a very high prevalence of malaria and equally high transmission to the babies as at the time of the study. There is therefore an urgent need to enforce the IPTp in the study area. Additionally, there is need for increased awareness and education among women of child-bearing age for the other viral infections especially HIV in order to reduce mother to child transmission. The continuous use of PMTCT must be emphasized and the control measures for these infections should be improved and strengthened by the health facilities and other stake holders. A more recent study with a larger sample size is very imperative to ascertain the current status of these infections in the study area.

Limitations to the study

The major limitation to the study was the lack of sociodemographic data of the women as well as their stage of pregnancy. As a result of this we were not able to associate the degree of malaria parasitaemia with the age, parity and stage of the pregnancy. We know that parity and age are major risk factors of malaria in pregnancy. However, the study has revealed the poor use of IPTp among pregnant women in the study area as at the time of study.

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