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Occurrence of Parvovirus b19 Infection Among Pregnant Women in Lagos, Nigeria

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ABSTRACT

Infections with B19V have been associated with fetal loss, acute arthritis and arthralgia as well as chronic anemia in immunodeficient persons. Pregnant women infected with B19V have 30% chance of transmission to the foetus. This study was carried out to ascertain the occurrence of current or recent infections with B19V among pregnant women in Lagos.

Methods: A commercially available Enzyme linked Immunosorbent Assay Kit (Parvovirus B19 RIDASCREEN biopharma. Germany) was used to analyze 93 serum samples collected from pregnant women in Lagos, aged between 18 and 35 years.

Results: A total of ninety three (93) samples were analysed and 35 samples (37.6%) were positive for virus specific IgM antibody. B19V IgM seropositivity was found to be highest in the 26-30 years age group with 20 samples (44.4%) tested positive. The lowest B19V seropositivity (0%) was found among the 16-20 years age group where no positive case was recorded. The highest frequencies of 50% and 30% were recorded among women in their 2nd and 3rd trimesters respectively.

Conclusion: The active infection of B19V among pregnant women exist in Lagos, and the high incidence of this infection among the women in their first and second trimesters of pregnancy may have some serious implications on the outcomes of these pregnancies. Hence, the need to take practical steps to ensuring that transmission of B19V is curbed.

INTRODUCTION

Infection with parvovirus B19 (B19V) during pregnancy is frequently asymptomatic for the mother and may not cause serious impairment to the foetus. However, in pregnant women who are immunocompromised or suffering from pre-existing haematological conditions, or infected foetuses where there is widespread tissue inflammation and red-cell destruction, mortality and serious morbidity may occur (Lamont *et al*., 2011; Khameneh *et al*., 2014).

Respiratory droplets transmission is common for B19V, however, it can also be spread through contaminated blood, organ transplantation and vertical transmission from mother to foetus (Heegaard and Brown, 2002). B19V frequently causes transient red cell aplasia (TRCA) in children with sickle cell disease (SCD) (Goldstein *et al*., 1987; Serjeant *et al*., 1993; Serjeant *et al*., 2001). Other complications connected with B19V which may result in chronic medical conditions or disease if left untreated include acute splenic sequestration, hepatic sequestration, acute chest syndrome, meningoencephalitis, nephrotic syndrome, and stroke (Wethers *et al*, 2000; Mallouh *et al*., 2000; Koduri *et al*., 1994; Lowenthal *et al*., 1996).

B19V vertical transmission from mother to fetus occurs in about 30% of the cases of maternal infection and in 2-5% of these cases, results in hydrops fetal is or fetal death (Slavov *et al*., 2011). Infection of the endothelium of the placenta may lead to structural and functional impairment of the blood exchange between the mother and the fetus and enable the fetal involvement of B19V (Pasquinelli *et al*., 2009). The highest threat of trans placental transmission is between the first and second trimesters (Slavov *et al*., 2011). Intravascular and intraperitoneal transfusion of high doses intravenous globulin may help to clear B19V and normalize the blood circulation and anemia (Hsu *et al*., 2007).

B19V fetal infection may resolve spontaneously with delivery of an apparently normal infant, or lead to severe consequences such as spontaneous abortion, non-immune fetal hydrops and fetal death. Besides fetal anemia, thrombocytopenia secondary to B19V infection has also been reported (Segata *et al*., 2007). Rare cases of congenital anomalies have also been described and include chronic anemia, meconium peritonitis, congenital heart disease, fetal hepatic calcifications, and bilateral opacification of the cornea (Brown, 1994; Zerbini *et al*., 1998; Wang *et al*., 2004; Simchem *et al*., 2002; Plachoura *et al*., 1999).

Despite the knowledge of the serious challenges or health implications B19V poses on the unborn child from infected mother, B19V is not being routinely screened for in our clinics hence data on the subject is scarce. Thus, this study is designed to screen pregnant women for human parvovirus B19 IgM to determine its prevalence among this population.

MATERIALS AND METHODS

Study Subjects

A total of 93 pregnant women aged between 18 to 35years were recruited for this study between June and August, 2015. These consisted of pregnant women attending General Hospital, Randle; Reddington multispecialty Hospital, Victoria Island and Reddington multispecialty Hospital, Ikeja, Lagos. Blood samples (5ml) were collected from study subjects, spun at 3000rpm for 5minutes, sera separated with micropipettes and stored at -20^{o}C until further analysis. Ethical approvals were obtained from the management of the hospitals used for this research. Verbal consent was also obtained from each of the participating patients.

Detection of anti-B19V antibodies

An enzyme immunoassay for the quantitative determination of Immunoglobulin (Ig) M antibodies against B19V in human serum was performed using the commercially available Enzyme linked Immunosorbent Assay Kit (Parvovirus B19 RIDASCREEN biopharma. Germany). All reagents were brought to room temperature. The assay, which uses the VP1 and VP2 recombinant proteins to capture IgM, was performed according to the manufacturer's instructions using peroxidase-labeled rabbit anti-human IgM as the secondary antibody, tetra methyl benzene as a substrate and 1M H_2SO_4 as a stop solution. Briefly, 100µl standard controls were added into the first three wells, then 100µl of diluted sample (ratio 1: 10) was dispensed into subsequent wells and incubated at 37^{0}C for 30minutes. At the end of incubation time, the wells were washed four times with wash buffer to remove unbound antibodies after which 100µl of conjugate was added to each well and incubated at 37^{0}C for 30minutes. The washing process was also carried out four times before adding 100µl of substrate. A 50µl of the stop solution was added to the wells and incubated for 15minutes after which the result was read macroscopically and absorbance read spectrophotometrically at a wavelength of 450nm.

Statistical analysis

The data obtained were subjected to descriptive statistical analysis using SPSS Version 20. Chi squared test was used to determine association between data obtained with B19V infection and the differences

were considered to be statistically significant when the p-value obtained was less than 0.05.

RESULTS

A total of ninety three (93) serum samples were analyzed for parvovirus B19 antibody using Parvovirus B19 RIDASCREEN (biopharma. Germany). Thirty five (35) samples (37.6%) were positive for virus specific IgM antibody while 58 samples were negative.

Table 1 shows the age distribution of parvovirus B19 IgM sero-positivity among the pregnant women. B19V IgM was detected in most age groups, however the highest frequency of B19V IgM sero-positivity was found among the 26-30 years age group in which 20 samples (44.4%) tested positive. The lowest B19V sero-positivity was found among the 16-20 years age group in which there was no positive sample recorded.

Table 1: Age distribution of parvovirus B19 IgM among pregnant women

Age (years)	**Positive samples (%)**	**Negative samples (%)**	**Total (%)**
16-20	0 (0.0)	1 (100.0)	1 (1.1)
21-25	3 (33.3)	6 (66.6)	9 (9.7)
26-30	20 (44.4)	25 (55.5)	45 (48.3)
31-35	12 (31.5)	26 (68.4)	38 (40.8)
Total (%)	35 (37.6)	58 (62.4)	93 (100.0)

The trimester distribution of B19V IgM sero-positivity is shown in Table 2 in which the highest frequencies were recorded among women in their 2nd and 1st trimesters. Fifteen (15) out of 30 women (50%) in their 2nd trimester tested positive to B19V IgM; 15 out of 50 women (30%) in their 3rd trimester; and 5 out of 13 women (38.4%) in their 1st trimester.

Table 2: Trimester distribution of parvovirus B19 IgM among pregnant women

Trimester	Positive samples (%)	Negative samples (%)	Total (%)
1st	5 (38.4)	8 (61.5)	13 (13.9)
2nd	15 (50.0)	15 (50.0)	30 (32.3)
3rd	15 (30.0)	35 (70.0)	50 (53.7)
Total (%)	35 (37.6)	58 (62.4)	93 (100.0)

In Fig. 1, the history of birth defects among the B19V IgM positive women in the study subjects were documented including history of miscarriages and still births in previous pregnancies. Fifty one percent (51%) of the women had miscarriages; 6% had still births; whereas there were no birth defects in 43% of the women.

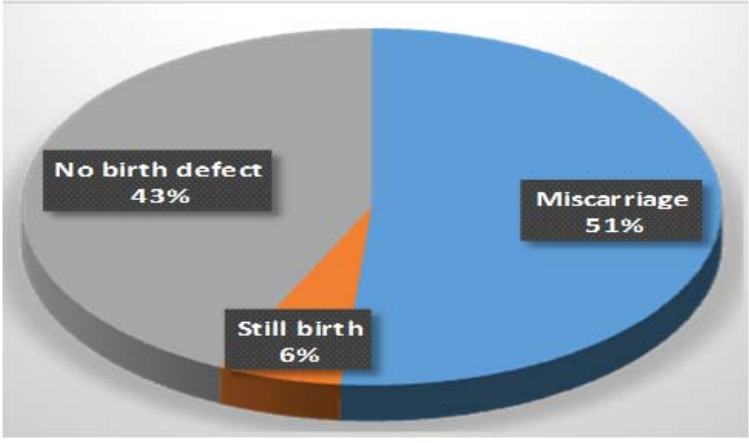

Fig. 1: History of birth defects among B19V IgM positive pregnant women.

Fig. 2 shows the association between occupational history and household exposure to school age children and anti-B19V IgM sero-positivity. Among the forty-eight (48) pregnant women who had previous history of exposure to school children, 22 of them were positive while in the non-exposed and occasionally exposed groups, 2 and 11 samples were positive of the 9 and 36 samples screened respectively.

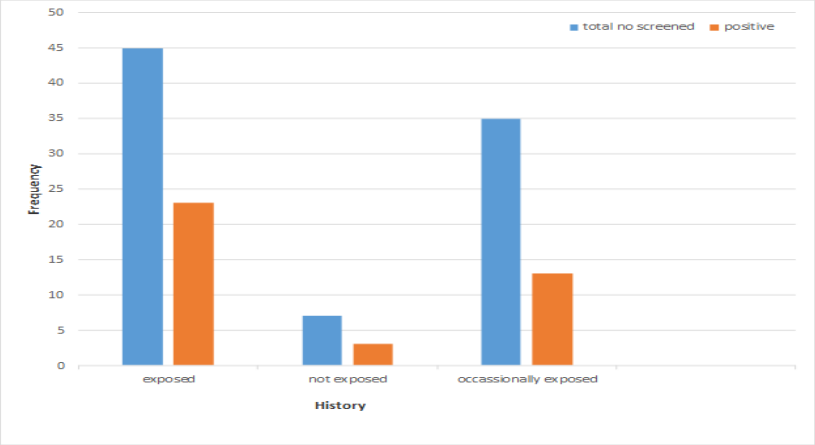

Fig. 2: Association between history of exposure to school age children and B19V IgM seropositivity

DISCUSSION

Infections with B19V have been associated with fetal loss, acute arthritis and arthralgia as well as chronic anemia in immunodeficient persons (Lowenthal *et al*., 1996; Dijkmans *et al*., 2012; Landry, 2016; Rajput *et al*., 2012). In pregnant women with B19V infection, there is a 30% chance of transmission to the foetus (Anand *et al*., 1987; Yaegashi *et al*., 1998; Miller *et al*., 1998).

In this study, thirty five of the population screened tested positive, given a prevalence of (37.6%). This is quite high when compared to similar studies in which Akyala *et al.* (2012) recorded 13.2% sero-positivity among pregnant women in Nasarawa State; and Abiodun *et al.*(2013) recorded 4% among pregnant women in Oyo State. Other studies in Africa and Europe have also reported much lower incidence of 2% (Letalef *et al*., 1998) and 10.3% in the Middle East (Keikha *et al*., 2006). This finding shows that a high proportion of our study subjects were non-immune individuals and further suggests a high rate of active transmission of B19V in our environment.

B19V IgM was detected in all age groups, however the highest incidence of B19V IgM sero-positivity was found among the 26-30 years age group in which 20 samples (44.4%) tested positive. This is slightly similar to the findings of Abiodun *et al.* (2013) in which the highest incidence was recorded among the 22-27 years age group. The lowest B19V sero-positivity was found among the 16-20 years age group in which none of the samples screened tested positive. This does not quite represent the trend because only one sample fell into this category.

The trimester distribution of B19V IgM sero-positivity in which the highest frequencies were recorded among women in their 2nd trimester followed by those in their 1st trimester. This is very disturbing because, in the 1st and 2nd trimesters, the P-antigen is expressed, hence, the foetus is at increased risk of infection and tissue damage from B19V than in the 3rd trimester (Chisaka *et al.*, 2003). This study is however limited in not following through the outcome of these pregnancies. Akyala *et al*. (2012) reported a similar finding of high incidence among women in their 2nd trimesters.

The positive subjects to B19V infection with history of birth defects in previous pregnancies revealed those that have had still births and miscarriages showed significant incidence of 6% and 51%

respectively, whereas the incidence among women with no previous birth defect had an incidence of 43%. This observation further reinforces the possible outcomes of B19V infection during pregnancy as previously described (Chisaka *et al.,* 2003). The association between occupational history or household exposure to school age children and anti-B19V IgM sero-positivity was clearly higher among the women who were exposed and those who were occasionally exposed than those who were not exposed. This further supports the assertion that exposure to children of school age is a risk factor in the transmission of B19V (Gilbert *et al*., 2005; Crane *et al*., 2014)

In conclusion, this study raises serious concerns on the active transmission of B19V among pregnant women in Lagos, and the high incidence of this infection among the women in their first and second trimesters of pregnancy may have some serious implications on the outcomes of these pregnancies. Hence, the need to take practical steps to ensuring that transmission of B19V is curbed.

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