Original Article

Seroprevalence of parvovirus B19 IgG and IgM antibodies among pregnant women in Oyo State, Nigeria

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Abstract

Introduction: Human parvovirus B19 causes a wide range of complications in pregnant women including abortion, severe fetal anemia, non-immune hydrops fetalis, and even intrauterine fetal death. However, there is a dearth of information on the prevalence of the virus among pregnant women in southwestern Nigeria.

Methodology: Blood samples were collected from 231 pregnant women and screened for antibodies to human parvovirus B19 IgM and IgG using an enzyme immunosorbent assay kits.

Results: Of the 231 women, 31 were in their first trimester, 146 were in their second trimester, and 54 were in their third trimester. Forty-five (20%) were positive for parvovirus B19 IgG antibodies, 10 (4%) were positive for parvovirus B19 IgM antibodies, and 176 (76%) had no detectable parvovirus B19 antibodies. Twenty-eight (19%) of the 146 pregnant women in their second trimester were positive for parvovirus B19 IgG antibody while three (2%) of the 146 were positive for parvovirus B19 IgM antibody.

Conclusions: It is evident that there is a high prevalence of human parvovirus B19 among pregnant women in south-western Nigeria. This suggests that there is an active transmission of the virus in the community; it is therefore necessary to conduct more studies on the virus in pregnant women in Nigeria to ascertain its effect on the fetus.

Key words: parvovirus B19; pregnancy; seroprevalence; antibodies

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Introduction

Parvovirus B19 infection during pregnancy is mostly asymptomatic, but in approximately 3% of infected pregnant women it might cause a range of complications, including abortion, severe fetal anemia, non-immune hydrops fetalis (NIHF), and even fetal demise [1,2]. Several factors have been associated with an increased risk of acute parvovirus B19 infection in pregnant women. For example, women who have only one child have a threefold greater risk of infection compared with nulliparous women. Also, the risk increases about seven and a half times in women with three or more children. Working in nursery schools, after-school clubs, or day-care centres also appears to increase the risk [3,4]. Similarly, serious medical conditions and stressful jobs have been identified as risk factors [5].

Although the virus can be contracted in any trimester, the second trimester seems to carry the highest risk of fetal loss [6]. Prospective studies of pregnant women have found that if the patient was susceptible to parvovirus B19 infection, her fetus might suffer from profound sequelae such as fetal hydrops, anemia, and even potential demise [7]. However, in a retrospective study of 300 babies with congenital anomalies, it was found that the incidence of parvovirus B19 was not higher than in healthy infants, meaning that parvovirus B19 toxicity is embryologic rather than teratogenic [8].

One study found that in patients with a history of previous miscarriages due to parvovirus infection, the antibodies to B19 were still present during their next pregnancy; however, there was no increase in the likelihood of miscarriage in the next pregnancy due to the presence of these antibodies [9]. While many reports indicate that B19 infection in pregnancy leads to adverse results, either miscarriage or hydrops fetalis [1,10], others have described a favourable pregnancy outcome after confirmed parvovirus B19 infection in pregnancy [11]. One study showed that 9% of women

infected before 20 weeks of gestation suffered a fetal loss due to parvovirus B19, and the possible risk of a congenital abnormality due to parvovirus B19 was under 1% [12]. It is, therefore, important that the mode of transmission and rate of infection for pregnant women should be defined more precisely. This information will determine the need for a parvovirus B19 vaccine, and whether preconception screening is needed, as in the case of rubella.

Nigeria has a very high maternal and child mortality rate. The Nigerian government is working towards mitigating the effect of this scourge through the implementation of Millennium Development Goals (MDGs). Different diseases and illnesses have been implicated to be the cause of this high maternal and child mortality rate. These include malaria, measles, whooping cough, polio, cerebrospinal meningitis, gastroenteritis diarrhea, tuberculosis, bronchitis, waterborne infectious diseases such as schistosomiasis, and sexually transmitted infections. However, parvovirus B19 infection, which has been reported to cause maternal and child mortality in some other countries [13], has not been implicated as a cause of mortality in Nigeria. In this study, we determined the seroprevalence of parvovirus B19 IgG and IgM antibodies among pregnant women in Ibadan, south-western Nigeria, and evaluated the effect of certain risk factors that could predispose pregnant women to infection.

Methodology

The study was conducted between April 2010 and July 2011 at Adeoyo Memorial Hospital, Ibadan Oyo State, Nigeria. A total of 231 pregnant women within the age range of 18 to 45 years and at various trimesters of pregnancy attending the antenatal clinic of the hospital were included in the study. Informed consent was sought from all the women recruited into the study. The study was approved by the ethical committee of the hospital. Blood samples were collected, and the serum was separated and stored at -20^{o}C until use. Parvovirus B19 IgM and IgG were assayed from the samples using an enzyme-linked immunosorbent assay (ELISA) kit (Focus Diagnostics, Cypress, USA) following the manufacturer's instructions. Statistical analysis was conducted using Predictive and Analytic Software (PASW) version 18.0. The Chi square test was applied to assess the association between the categorical variants. A p-value of < 0.05 was considered not significant.

Results

Of the 231 pregnant women tested, 45 (20%) were positive for parvovirus B19 IgG antibody, 10 (4%) were positive for IgM, and 176 (76%) had no detectable parvovirus B19 antibodies. No detectable IgM was observed in the age group above 38 years, while the IgM prevalence was highest (11%) among women under 21 years of age. The parvovirus B19 IgG was highest (24%) among women between 22 and 27 years of age (Table 1). Of the 45 pregnant women positive for B19 IgG, 21% had not worked in a day care, nursery, or other place where children were present; among the 10 pregnant women that tested positive to the IgM antibody against parvovirus B19, none had worked in places where there were children present (Table 3). The highest prevalence of parvovirus B19 IgG (29%) was observed among pregnant women who had five or more previous children. Similarly, the prevalence of parvovirus B19 IgM antibody (14%) was highest among study subjects with five or more previous children (Table 2).

Twelve (22%) of the 54 pregnant women in their third trimester were positive for parvovirus B19 IgG antibody. Five (9%) of the 54 study subjects in their third trimester were positive for parvovirus B19 IgM antibody (Table 3). Only one out of the six HIV-positive pregnant women (17%) was positive for parvovirus B19 IgG, while none of pregnant women positive for HIV antibodies were positive to parvovirus B19 IgM (Table 3). Eleven (15%) of the 74 pregnant women who had lost pregnancies tested positive for parvovirus B19 IgG antibody. Only one (1%) of 74 pregnant women positive for parvovirus B19 IgM had lost a previous pregnancy (Table 3).

Discussion

The results of this study showed that 20% of the pregnant women tested had parvovirus B19 IgG antibody, indicating that the virus is endemic among pregnant women in south-western Nigeria. This finding is similar to that of a recent study in Jos, north central Nigeria, where the prevalence of parvovirus B19 IgG antibody among pregnant women was 27.5% [14]. These findings further indicate that the virus is endemic among pregnant women in Nigeria. However, many of the women examined in the Nigerian studies had lower IgG seroprevalence when compared to studies conducted in other African countries such as Libya, where a 61% seroprevalence of B19 IgG antibody was reported [15].

Table 1: Prevalence of parvovirus B19 IgG and IgM among different age groups of pregnant women

Age (years)	Number of pregnant women tested	Parvovirus B19 IgG positive (%)	Parvovirus B19 IgM positive
≤ 21	37	7 (18.9%)	4 (10.8%)
22-27	76	18 (23.7%)	2 (2.6%)
28-32	80	13 (16.3%)	2 (2.5%)
33-37	29	6 (20.7%)	2 (6.9%)
≥38	9	1 (11.1%)	0 (0%)
Total	231	45 (4.3%)	10 (4.3%)

Table 2: Prevalence of parvovirus B19 IgG and IgM antibodies in pregnant women with previous children

No of previous children	Number of pregnant women tested	Parvovirus B19 IgG positive (%)	Parvovirus B19 IgM positive
0	59	11 (18.6%)	4 (6.8%)
1	62	12 (19.4%)	2 (3.2%)
2	46	12 (26.1%)	0 (0%)
3	34	5 (14.7%)	2 (5.9%)
4	23	3 (13%)	1 (4.3%)
5	7	2 (28.6%)	1 (14.3%)
Total	231	45 (19.5%)	10 (4.3%)
p-value		0.734	0.417

Table 3: Prevalence of parvovirus B19 IgG and IgM antibodies in pregnant women according to trimester, HIV status, history of abortion, and history of working with children

Stages of pregnancy	Number of pregnant women	Parvovirus B19 IgG positive (%)	Parvovirus B19 IgM positive (%)
First trimester	31	5 (16.1%)	2 (6.5%)
Second trimester	146	28 (19.2%)	3 (2.1%)
Third trimester	54	12 (22.2%)	5 (9.3%)
Total	231	45 (19.5)	10 (4.3%)
p-value		0.783	0.069
HIV status			
HIV negative	225	44 (19.6%)	10 (4.4%)
HIV positive	6	1 (16.7%)	0
Total	231	45 (19.5%)	10 (4.3%)
p-value		1.000	1.000
History of abortion			
Yes	74	11 (14.9%)	1 (1.3%)
No	157	34 (21.7%)	9 (5.7%)
Total	231	45 (19.5%)	10 (4.3%)
p-value		0.286	0.175
Working with children			
Yes	44	5 (11.4%)	0 (0%)
No	187	40 (21.4%)	10 (5.3%)
Total	231	45 (19.5%)	10 (4.3%)
P-value		0.145	0.214

In Malawi and Tunisia, a seroprevalence of 58% and 65%, respectively was reported among women tested [16,17].

In the current study 4% (10), of the pregnant women tested were positive for parvovirus B19 IgM. Of these, two were in their first trimester, three were in their second trimester, and five were in their third trimester. This is similar to findings in Libya and Iran, where IgM prevalences of 5% and 10% were reported, respectively, among pregnant women [15,18]. Parvovirus B19 infection in a pregnant woman in the second-trimester can result in hydrops fetalis and fetal loss, fetal anemia, spontaneous abortion, and stillbirth. In the current study, only three (2%) pregnant women had evidence of recent infection in their second trimester, as determined by their seropositivity for parvovirus B19 IgM. However, this study has a limitation of not being able to follow up with these women to know their pregnancy outcomes.

There was no significant variation in the prevalence of parvovirus B19 IgG seropositivity between the age groups of the pregnant women tested even though the seroprevalence of IgG antibodies to B19 is known to be age dependent. A survey in the USA showed a gradual increase in seropositivity with age, ranging from as low as 19% in children under 10 years of age to 67% in individuals over 49 years of age, suggesting continued exposure to the virus [19]. However, the current study showed an insignificant effect of age on both IgG parvovirus B19 seroprevalence and incidence of seropositive IgM; this is similar to a study in Kuwait [20]. The highest prevalence of parvovirus B19 IgM antibody (10.8%) was in the 22 to 27 age group, and lowest in the 38 years and older age group. This might be due to the fact that the younger women had never had previous infection as compared with older women.

In conclusion, this study shows that parvovirus B19 infection is endemic in south-western Nigeria. To achieve the Millennium Development Goal of reducing high maternal and child mortality rates, further investigations of the B19 infection in pregnancy are needed to ascertain if primary infection

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